



FRIDAY, MARCH 28, 1879.

Double-End, Narrow-Gauge, Tank Locomotive for the Matanzas Railroad.

The main peculiarity of this locomotive, which was constructed by the Rogers Locomotive Works, is its running gear, which combines a long wheel-base, with the flexibility necessary to overcome the sharp curves of the road. As seen in the accompanying engraving, the tender is rigidly connected with the engine, and the arrangement of frames admits of a wide fire-box, which with the ordinary arrangement of frame would be very limited in width, as the gauge of the road is only 2 ft. 6 in. The front part of the engine-frame is made of the ordinary form, with a wooden bumper timber bolted to it at the front end. At the back end it abuts against a transverse bar or cross-piece, which is fastened to the front of the fire-box. The back or tender portions of the frames are bolted to the outer ends of this cross-piece. This permits the fire-box to be made of any desired width, the latter being limited only by the distance apart of the back parts of the frame and the length of the cross-pieces.

The back parts of the frame are made of channel iron 8 in. high, and are braced laterally at their back ends, and also close to the fire-box, by cross-pieces of the same shape. Between this last cross-piece and the cross-brace of the engine-frames are two longitudinal plates, which are bolted to them, and which support the fire-box, being placed one on each side of it, and attached by means of ordinary expansion pads.

The engine is supported on eight wheels, of which six are drivers, and the front pair truck wheels. The engine-truck

Fire-box heating surface to total.....	9.89
Grate area to heating surface.....	58.1
Ratio.....	
Contents of one steam cylinder in cubic feet, to the heating surface, in square feet.....	428.8
Length of smoke-box.....	36 in.
Diameter of chimney.....	12 in.
Total wheel-base.....	31 ft. 1 in.
Engine wheel-base.....	16 ft. 1 1/2 in.
Tender truck wheel-base.....	6 ft. 0 in.
Driving-wheel-base.....	9 ft. 3 in.
Distance between the centre of the truck axle and the centre of the first driving axle.....	6 ft. 10 1/2 in.
Distance between centre of back driving axle and centre of the tender truck.....	11 ft. 11 1/2 in.
Weight of locomotive empty.....	57,000 lbs.
Weight of locomotive loaded.....	74,200 "
Weight on driving-wheels.....	40,200 "
Weight on pony truck.....	8,000 "
Weight on tender truck.....	26,000 "
Capacity of water-tank.....	1,300 gals.

The tractive force per each pound of effective steam pressure per square inch on the pistons is

$$\frac{13.5 \times 10}{33.75} = 80.4 \text{ lbs.}$$

The fuel used is bituminous coal.

Contributions.

A Locomotive's Record.

Pittsburgh, Cincinnati & St. Louis Railway Company, CINCINNATI, O., March 21, 1879.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice in the Gazette of March 14, page 149, the following:

"A Locomotive with a Good Record.—Engine No. 62, built at the popular Brooks Locomotive Works, at Dunkirk, N. Y., and placed upon the Western Division of the Erie road, February, 1870, now presents to those interested in good locomotives and good engineering, a record unparalleled on the Erie road, and perhaps second to none on any other road in this country.

"She went to shop for her first general repair Oct. 19, 1874, having run 143,547 miles. She left the shop December, 1874; from which time up to Feb. 2, 1879, she has made 136,586 miles, and is still making her regular daily trips on

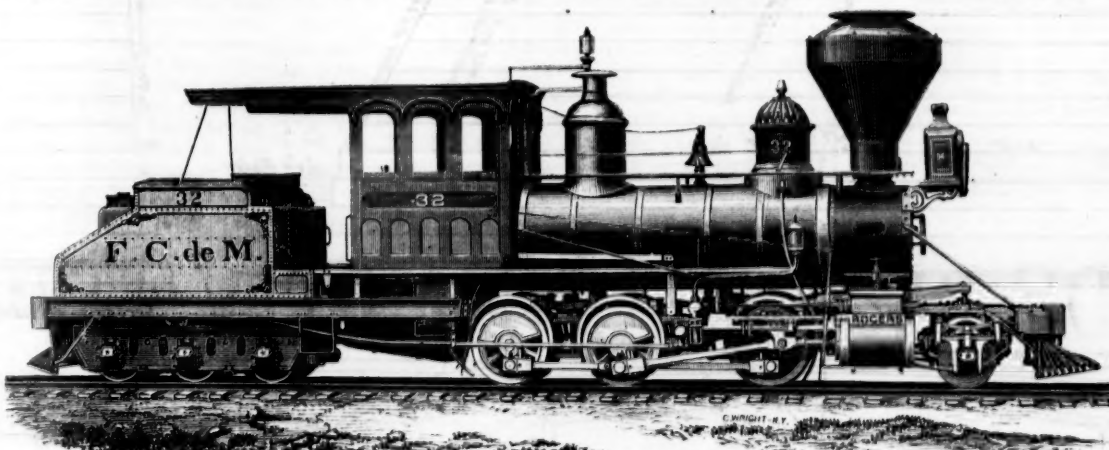
skins, and are specially prepared for us by the American Meter Company of Philadelphia. J. M. FOSTER & CO.

An Association of Inventors.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I wish to inquire through your columns what objection there would be to an association of inventors, for maintaining their rights under their patents, similar to the Eastern and Western Railroad Associations, whose object seems only for the purpose of allowing the roads combined to appropriate any invention that they are convinced is an economical improvement. Whereas now one poor inventor may be pitted against the seventy-five or eighty rich and powerful roads in the West, and probably forty in the East, and when the two associations combine together to fight one patentee singly, in many cases might would overpower the right. As these roads have combined to say what they think should be or can be patented, I think inventors should combine to sustain a patent granted by the Commissioner of Patents through competent examiners, appointed for the special purpose of determining whether the invention is worthy of a patent or not; and if the examiners are not competent to decide, would it not be better for them to apply to the attorneys of their association for their opinion before granting a patent and thereby save much or all litigation. True, it might be the means of abolishing the patent office, but inventors would save their money and time wasted in vexatious lawsuits. Combinations beget combinations; so if inventors would form such an association the cost of a suit would be very light on each individual member should the suit be lost, and if won by the "plucky inventor" he could afford to pay the expense out of his own pocket. The writer submits these ideas to the many inventors that read your valuable paper and invites criticism from any source. W.

[In reply to what our correspondent has written, it may be said that no sufficient reason can be given why



TANK LOCOMOTIVE, 2 FT. 6 IN. GAUGE:

By the Rogers Locomotive and Machine Works, Paterson, N. J.

is a pony swing truck with a radial bar, carrying the load on two side-bearings. This arrangement, used by Mr. Hudson also on other engines, could not be clearly explained without a detailed drawing, and it will suffice to say here that it readily assumes a suitable position on a curve. The tender is supported on a six-wheeled centre-bearing swing truck. The upper centre plate is attached to two cross-braces, 5 1/2 in. high, which are bolted to the longitudinal members of the tender frame. The truck frames consist of double plates, 19 in. high, between which cast-iron guards for the axle-boxes are bolted. Each box carries an elliptic spring which is placed between the plates of the truck frames. The truck frames are braced laterally by two cross-braces at the bottom, and two at the top; the latter carrying the swing-hangers which support the lower centre plate of the truck. The weights on the axles are distributed by means of equalizing levers. The load on the front (pony truck) axle is equalized with that on the first driving axle, the load on the second driving axle with that of the third driving axle, and the tender truck axles have the load equally distributed between them by two pair of equalizers. The boiler has the tubes and the inside fire-box, excepting the flue sheet, of copper, the rivets and stay-bolts being of the same material. To reduce the weight of the back end of the boiler, the crown bars have been dispensed with, by lowering the crown sheet of the outside fire-box shell, which is flat, below the upper line of the cylindrical portion of the boiler, and bracing it with the crown sheet of the inside fire-box with stay-bolts. The front and the back sheets of the fire-box are not vertical but inclined, and the crown sheet also inclines toward its back end. The tube sheet is set back from the waist, forming a combustion chamber 14 in. deep.

The following are the dimensions of this locomotive:

Diameter of cylinders.....	13 1/2 in.
Stroke of pistons.....	16 "
Diameter of driving-wheels.....	33 3/4 "
Diameter of truck-wheels.....	34 "
Largest outside diameter of the boiler.....	43 1/2 "
Inside length of the fire-box.....	43 1/2 "
Inside width of the fire-box.....	32 1/2 "
Height of the inside fire-box.....	40 "
Number of flues.....	48 1/2 "
Diameter of flues.....	2 in.
Length of flues.....	11 ft. 11 in.
Heating surface of tubes.....	510.7 sq. ft.
Heating surface of fire-box.....	57.4 "
Total heating surface.....	568.1 "
Area of grate.....	9.6 "

the branch with good prospects of remaining out of the shop for one or two years yet. While such a record sets forth the ability of the engineer who has had her in charge during these years, Mr. Alfred Mark, one of Erie's oldest and best engineers, it also speaks well for the builders.—Hornellsville (N. Y.) Times, March 6."

Now, Mr. Editor, I do not know of an engineer that I would rather beat than my old friend Alf. Marks, of the Erie, or a builder that I would rather throw a little in the shade than H. G. Brooks, of the Brooks Locomotive Works. I therefore send you the record of Engine 207, of the Little Miami Division of the Pittsburgh, Cincinnati & St. Louis Railway, Joseph Davis, engineer.

Engine 207 was built at the company's shops in Pendleton, being completed Dec. 9, 1874, and placed upon a regular train Dec. 10.

Up to March 3, 1878, the engine had run 1,178 consecutive days, making an average of 122 1/2 miles per day, or a total of 144,126 miles.

Cost per mile for repairs.....	1.53 cents.
" " fuel.....	4.09 "
" " stores.....	0.67 "
" " engineer and fireman.....	4.14 "
Total average cost per mile run.....	11.24 cents.
Average number of cars drawn per mile.....	5.11
Total average cost per car per mile.....	2.19 cents.
Average number lbs. of coal consumed per car mile.....	8.10
Average miles run to 1 ton coal.....	51.50
" " 1 quart oil.....	32.04

This was accomplished without any repairs, except the current repairs attending each trip, but a change in the gauge of track made it necessary to change the gauge of the wheels, and she was taken into the shop for that purpose after making the above record. The machinery was found in good condition and entirely capable of making another 50,000 miles. J. H. SETCHEL, Master Mechanic.

The Diaphragm of the Foster Compressed-Gas Governor.

PHILADELPHIA, March 24, 1879.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of March 21 you refer to Foster's compressed-gas governor as having a "rubber" diaphragm. We desire to correct this wrong impression, because it is a well-known fact that any preparation of rubber yet made has failed to withstand the chemical action of hydrogen.

Our diaphragms are made from the best imported goat

he should not unite with another inventor, or a dozen or a thousand, to protect their rights in a legal way. They have just as good a right to do so as the Eastern and Western Railroad Associations have for their existence. After a good deal of intercourse with inventors, however, we doubt whether as a class they have the gift of coöperation developed to a very great degree, and there is room for a grave suspicion that the conduct of the Kilkenny cats might be regarded as peaceful compared with that which would result if inventors with conflicting claims should undertake to "run" an association such as is suggested.

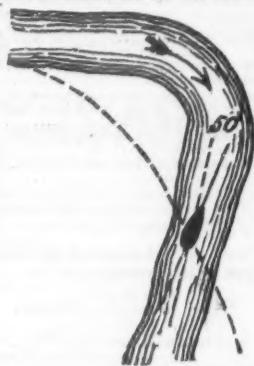
That the Eastern and Western Railroad Associations have a great deal of power, there can be no doubt; but there is nothing wrong or criminal in that. The question is whether they use that power oppressively or unjustly. With reference to that, our correspondent gives no information whatever. Any one familiar with the experience of railroad companies in the use of patents must know that they have been and are still subjected to the most unjust demands, often from conflicting patents and patentees, and part of the work of the associations named is often to determine which one out of a number of patentees or inventors, is entitled to compensation.

It is a dream of a good many inventors, our correspondent apparently among the number, that the patent office "should protect patentees." In other words, after a patent is granted, it should give the patentee an absolute right to the device described in his specifications. Now, patents are granted because things are "new and useful," therefore, there would be no justice in "protecting" a person if after a patent was granted to him it was found that his device was not new or not useful. Therefore, if the theory of the persons referred to was carried out in practice, either the examiners in the patent office must determine with absolute certainty whether so-called inventions are new and useful, or else great injustice

will often be done to persons who would be obliged to pay for the use of devices which are not new. Omniscience alone could determine in all cases whether devices on which applications are filed are new. After some thousands of years' experience, the civilized portion of mankind have found that a court of justice is the most efficient means of deciding justly such questions as usually arise in patent cases. To such tribunals inventors can all appeal, and at present no better means of doing justice to all parties is apparent.

That a rich defendant has advantages in litigation over a poor plaintiff is of course true in patent cases as in all others in which the courts of law must be invoked. The best lawyers charge the highest fees, and if a man is too poor to employ the best men, he must be content with a lower grade of talent. The expenses of nearly all patent litigation are high, and the chances of success always uncertain, so that if an inventor is too poor to pay the costs he is undoubtedly not on equal ground with a rich association which can. But how can this inequality be remedied is the question

The first bridge in this vicinity was built almost in the bend of the Deerfield River where it turns nearly a right angle. It was there located in order to avoid making a heavy



and expensive cut. As a consequence, the piers could not be located so as to stand longitudinally with the currents at all stages of the water in the river, which was subject to sudden floods of about 20 feet and were therefore unsafe in ice

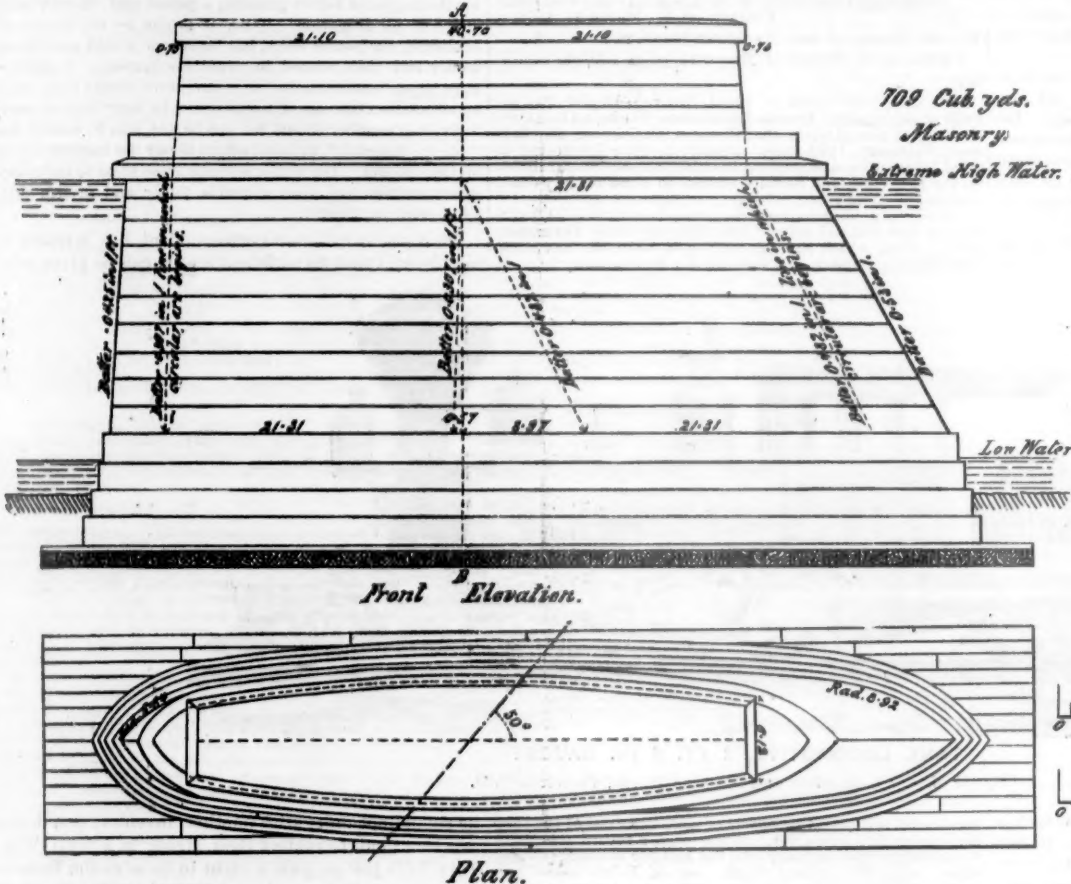
freshets. The piers of the bridge were also not tall enough, and the deck truss bridge was once carried away.

In the reconstruction of the Troy & Greenfield Railroad, the heavy cut before alluded to was made, the bridge was relocated about 600 feet below the former location, and the grade of the railroad and bridge was raised ten feet from where it had been.

In fixing the line of the piers, it was considered that their greatest exposure would be in highest floods with running ice. At such times the running water and ice will rise to a higher level by their centrifugal tendency on one side of the river than the other, and it will require some time and distance before the water will resume its level crosswise the river. In order to meet this condition of things, the piers instead of being placed in the axis of the river bed at the bridge location were swung around from it 5° in order to meet the foe square in the face.

The angle made by the piers with the centre line of the railroad as built was 50°. The masonry was to be double-track, the bridge to be of iron, with three trusses for double track. Only two trusses were at first to be put up, the central truss having twice the strength and weight of the outer ones.

The Deerfield River, because of its sinuosity, sudden and



which the world has discussed for some thousands of years, and it apparently is as far from a solution as ever. We are not sanguine that our correspondent's scheme will remedy the evil.—EDITOR RAILROAD GAZETTE.]

The Cross-Over Rule.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the note on the cross-over rule in last week's Gazette, to have fig. 1 correspond with the text, B should be substituted for g.

The Reading Locomotive at Paris.

POTTSTOWN, PA., March 24, 1879.

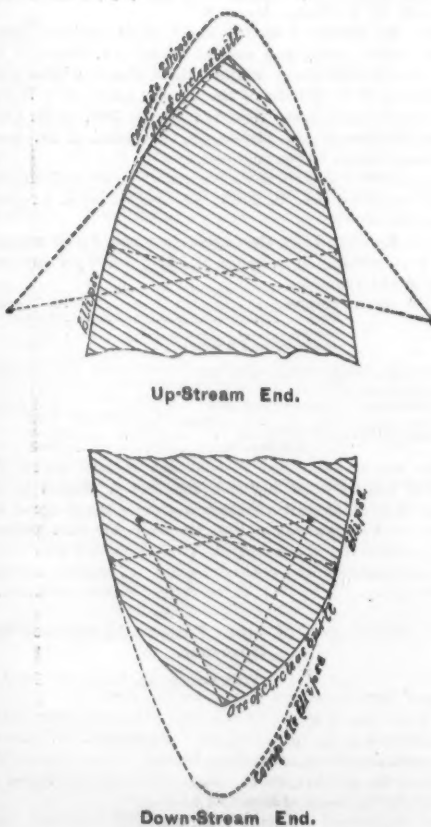
TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of March 21, 1879, you have engravings of engine No. 408, built by the Philadelphia & Reading Railroad Company. In your introductory remarks you allude to the fact of this engine having been on exhibition at Paris, and in conclusion you state that the engine is now running on some one of the Continental railroads. To begin with, the No. 408 has never been outside of the United States. And there are persons on the Old Colony Railroad who, when they see your article, will look incredulous, as the No. 408 was during part of last year running on the Old Colony Railroad, and is now at work on the Philadelphia & Reading Railroad. The engine which was exhibited at Paris was built after the No. 408, and is (I think) No. 412. There are some minor details about the No. 412, which do not correspond with the engravings in your paper. Maybe "Springfield" can see something in this engine worthy his notice.

Elliptical Piers.

[Paper read before the Boston Society of Civil Engineers, Feb. 10, 1879, by Thomas Doane, C. E.]

Some description of the stone piers of the Bardwell's Ferry Bridge on the Troy & Greenfield Railroad may not be uninteresting. I am not aware that such piers were ever before built in the form of ellipses.



great floods, and great quantities of ice, demands of the engineer great care in bridge construction. At the place in question the banks are very steep to points much above freshet level. With 150-ft. spans and 10-ft. piers, one-fifteenth part of the river space was to be obstructed. It therefore became important to put the masonry into the shape which should least obstruct the river and disturb the currents.

There is very little literature upon this subject. The following is from the English Encyclopedia of Engineering, by Edward Creasey, pages 1510-11: "To avoid contraction it is indispensable to make the startings very long and terminating in a point. Experiments were made on piers with square, triangular, circular and Gothic ends, also on elliptical piers." "In the sixth experiment the form was elliptical. The small diameter was one-fourth the large one. The water rose much less before the pier than in the other experiments, and the lateral currents had a uniform inclination along its faces [corresponding, I suppose, with the regular slope of the falling river]. Hence we may conclude that the elliptical piers have the property of occasioning the least contraction."

It was desirable to have piers pointed at both ends, to divide the water and ice above, and to bring them together again gently below without undermining them. It was also intended to place a three-truss bridge upon them, the central truss of which was to have a weight equal to both the other trusses. As the elliptical form seemed to meet all these requirements, besides, according to Creasey, obstructing the river less than any other form, the elliptical form was adopted for the piers.

Doubtless many engineers have desired to adopt some such form for river masonry, but have been deterred by a supposed extra cost, or by objections on the part of contractors, or both. This paper is written in part for the purpose of showing the small additional cost over rectangular masonry, and of urging the selection of the best forms for important public works. It is true, that in building these piers a good deal of time was demanded of the engineers in

making plans and in seeing that they were carried out; but the building did not involve much extra expense on the part of the contractor. He even offered to build the piers with semi-circular ends, which would have cost him much more than those which were built.

The abutments were placed at about low-water mark upon each bank of the river, and there were two intermediate piers. As the abutments would be in the river at high water, their river faces were of the same shape and size as the piers, and therefore were semi-ellipses with wings running back into the banks.

The portions of the piers below common low water were brought up in steps of 0.50 to each course of about 2.00 feet. The side batter of all masonry was 1 in 24 and the end batter 1 in 12, except starlings, which had much stronger batters, as shown by the drawings herewith. The freshest high-water line was about 20 feet above low water, and the top of the masonry and bottom chord of the bridge about 10 feet above common freshet level. Upon the masonry a deck bridge 20 ft. high was to stand.

At the top of the pier an ellipse having axes of 9.84 ft. and 53.93 ft. was adopted. The proportion of breadth to length was $\frac{1}{6}$. At the up-stream end the form was changed for a short distance to the Gothic, by circular curves of 8.17 ft. radius, and at down-stream end by circular curves of 4.91 ft. radius. These did not depart much from the true ellipse, and gave a sharper angle for ice-cutters. This ellipse with the Gothic ends gave the outline and size of the upper head course, but above high-water mark and when not exposed to the river the ends were cut off square. From this ellipse, allowing for the projection of head courses and for the side, end and starting batters, the ground or starting plans and dimensions were obtained. As the small amount of side batter, 1 in 24, would but slightly effect the form of the ellipse, the sides between the terminating circular curves were laid out by a single wooden form representing one-half the length of the ellipse, and cut to shape by ordinates calculated at each foot of length. In order to obtain the necessary starting slopes, the ellipse was cut in half and drawn apart sufficiently up stream and down stream to give the necessary slopes. The lines of the courses at the sides of the piers between the two halves of the ellipse would be straight. It was like cutting a vessel in two and lengthening her by putting in a straight piece amid-ships. The portion of the sides having straight lines at the joints of courses is embraced within the triangle at the middle of the side elevation, having sides parallel to the starting slopes. The circular curves have radii increasing in length by the amount of the batter between one course and the next, so that their centres remain fixed, except as the half-ellipses are drawn apart up and down stream. The lines on each course were given by maintaining accurately the centre lines of the masonry up and down river and measuring ordinates therefrom.

There was no face cutting in the masonry except some rough work on the up-river starting, nor were there any draughts cut on vertical or horizontal joints. A course having been laid, the plank form was placed upon the course. Its central end was placed at proper distance from the middle of the length of the pier, and its two ends were fixed by measuring the proper ordinates. A chalk line was then drawn, and the top edge of the course was then brought to the chalk line by a common hammer and a straightening iron or set. When stones of a succeeding course were to be laid, their vertical joints were brought to their proper batter and the front joint of its bed to its curve by the same board form and in a similar way. So there appeared no cutting on the face of the work and the joint lines were very good.

It is my own impression that this form of masonry, while costing the contractor very little extra in any way, was really an advantage to him, because it permitted the use of stone of varying dimensions. The breadth of the ellipse continually increased from the two ends till it became in the middle 2 ft. greater than at the ends, so that through headers and filling pieces of varying dimensions could be used. The curvature of the ellipse is not sufficient to make any extra trouble or expense. In that part of the ellipse having the shortest radius, a stretcher 6 ft. long would have a middle ordinate of but $\frac{1}{4}$ of an inch. There were few, however, more than 5 ft. long with middle ordinate of $\frac{1}{2}$ an inch. A stone 4 ft. long would have a middle ordinate of $\frac{3}{8}$ of an inch. When projections from the theoretical face of 3 in. were allowed, this curvature was a matter of no account whatever.

The cost of this masonry, all of the filling stone in each course having the rise of the course and all being laid in and filled with hydraulic mortar, was \$17 per yard. A large part of the stone was brought by rail from Irving at a cost for freight of \$2 per cubic yard and some of it from Fitchburg at a cost of \$3.33 per yard.

The masonry has been severely tested since it was finished. On page 168 may be found a plan, side elevation, and middle cross-section of the westerly pier. All other masonry of the bridge was founded on rock.

On page 168 may be found plans showing the departure of the "up stream" and "down stream" starlings, from the full form of the ellipse.

The Springfield Locomotive.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Recent communications unfavorably criticising the Springfield locomotive make painfully evident that many master mechanics have a very limited acquaintance with loco-

otive machinery in general. Their knowledge seems confined to their immediate scene of operations; the thousand and one published experiments made to secure improvements calculated to reduce to a minimum consumption of fuel and cost of repairs, only temporarily impress them, and their own prejudices and notions influence them most after all.

After 29 years of experiment Mr. Eddy finds that short ports are unquestionably most economical, even on passenger engines. The valves being much smaller, the steam pressure on them is a great deal less, and consequently less power is expended in moving them; the use of large ports necessitates the expulsion of a large amount of waste steam at each exhaust, which acts severely on the fire; and experience clearly shows that the steam can enter short ports with all the facility desired without wire-drawing.

The express engine "Beebe," with $5\frac{1}{2}$ -ft. wheels and 18×22 -in cylinders, is the only passenger engine on the road that has yet had ports as small as $10 \times 1\frac{1}{2}$ in.; and she gives such satisfaction that new passengers will have similar-sized ports. As to the trial with the "Brown," 5-16-in. inside lap was certainly an injury, but her builders made her that way; Mr. Eddy had nothing to do with the engine. Furthermore, every car hauled east by all three engines was loaded, and it was on these pulls east that the figures for the contest were based. If there are any engine-builders or railroad company who fondly believe a big port, balance-throttle-valve engine, passenger or Mogul, will burn less fuel or cost less in general repairs in doing the same amount of work than the Springfield machines, such are invited to send along the best illustrations of their theories under the control of their own men. Judges impartial enough to suit the visitors will be chosen, every courtesy possible extended, and means taken to insure results that cannot be questioned. Only one exception is made. Mr. Eddy will not guarantee to beat a Consolidation engine having a 4-ft. wheel.

SPRINGFIELD.

[If such a trial of engines as our correspondent suggests could be made, it would have very great interest and value, but in order to make it entirely fair, both engines should be on a foreign road. Possibly such a trial could be made under the direction of a committee of the Master Mechanics' or of the Eastern or Western Railroad Associations.—EDITOR OF THE RAILROAD GAZETTE.]

Working Steep Grades with Locomotives.

In a discussion at a meeting of the American Society of Civil Engineers, Mr. Octave Chanute, Assistant General Superintendent of the New York, Lake Erie & Western Railroad, made the following statement of some of the more remarkable performances of locomotives on steep grades:

The valuable paper contributed by Mr. Wells, and the very interesting reminiscences of early American achievements in railroad operating which it has called forth from the members of the Society seem to me to fully confirm the conclusion already reached by railway managers the world over, that the frictional adhesion of locomotive driving wheels upon the rail is sufficient to work almost any gradient likely to be found necessary in practice, and is, upon the whole, much the most economical to adopt. Other methods of traction, such as pneumatic tubes, ropes, gripping wheels upon a central rail, and racks and cog wheels have gradually been given up, as ineffectual and uneconomical complications; except perhaps for gradients of 15 or 20 feet per hundred, as at Mount Washington and at the Righi, where the latter method is in use. We find that at Madison,* upon a grade of 6 ft. per hundred, frictional traction has superseded the rack and cog wheel, and I believe that in all cases where the topography of the country compels the use of gradients of say 4 or 5 ft. per hundred, the weight of the boiler and working parts necessary to generate and apply the power required, will be found sufficient to give the necessary adhesion to utilize that power.

This, in a measure, results from the improvements which modern practice has introduced in locomotives. These consist mainly in a better distribution of the weights upon the driving-wheels, and in America, especially, in equalizing them by levers connecting the drivers with each other, so as to keep the relative weights upon them constant, while allowing them to adjust themselves to the inequalities of the track.

These equalizing levers, together with the centre-bearing truck under the front end of the engine, constitute the leading features of the American locomotive, which is undoubtedly more effective for a given weight than the type still adhered to by the Europeans.

In the early days of railroads it was assumed that an adhesion of $\frac{1}{4}$ or $\frac{1}{2}$ of the weight upon the driving wheels was a satisfactory performance. In France and in England, at the present day, the ordinary practice is to estimate for an adhesion of $\frac{1}{4}$ or $\frac{1}{2}$, while our locomotives work up regularly to $\frac{1}{2}$ in summer and $\frac{1}{4}$ in winter, of the weight on the drivers, with occasional performances much in excess.

The account given of the trial trip at Madison is a good case in point.

Upon the 9th of April, 1875, the engine took 210 tons (including its own weight) up a grade of $\frac{1}{16.5}$ or 6.06 ft. per hundred, on a straight line, at a speed of 6 miles per hour. The resistance may, therefore, be estimated as follows:

Gravity,	$\frac{6.06 \times 2,000}{100}$	= 121.20 lbs. per ton.
Wheel friction, generally	= 6.00	"
Atmospheric resistance, say	= 1.80	"
Total resistance,	129.00	"
Traction = 210 tons \times 129 lbs. = 27,090 lbs.		
As the engine weighed 112,000 lbs., or 56 net tons.		
Adhesion = $\frac{27,090}{112,000}$	= $\frac{1}{4.13}$	or nearly one-quarter.

Recent performances on the Boston & Albany railroad gave an adhesion, if I remember rightly, of $\frac{1}{3.6}$ while on the 3d of July, 1877, the "Mogul" locomotive Oakland started

* See Transactions, Vol. VII., page 68.—(March, 1878.)

from a stand-still "on a grade of 83 ft. per mile, combined with a 2° curve, 45 empty eight-wheeled cars, weighing 669,500 lbs., or 334.75 net tons, and, without slipping her drivers, took the train up and beyond the gradient something more than half a mile, gaining speed and steam as she went," as reported by Mr. J. M. Goodwin, Engineer of the Sharpville & Oakland Railroad, in a letter recently printed by the builders of the locomotive.

As the gradient is one of 1.58 ft. per 100, the resistance is estimated as follows:

Gravity	$\frac{1.58 \times 2,000}{100}$	= 31.60 lbs. per ton.
2 degree curve at $\frac{1}{4}$ lb. per °.	1.00	" " "
Wheel friction.	6.00	" " "
Atmospheric resistance, say,	1.40	" " "
Total resistance,	40.00	" " "
Traction—Train . . . 334.75 tons.		
Engine . . . 31,500 "		
Tender . . . 15,000 "		
Total . . . 383.25 tons \times 40 lbs. = 15,320 lbs.		
Adhesion 15,320 lbs.		
Weight on drivers . 57,000 lbs.		
	$\frac{15,320}{57,000}$	= ratio of adhesion.

A performance by no means to be regarded as singular, as the new "consolidation" engines upon the Erie Railway work regularly up to a maximum traction of 19,500 lbs., as measured by the dynamometer and have occasionally indicated 22,000 and 24,000 lbs., with a weight upon their eight driving-wheels of 87,500 lbs.

$$\text{In this case the adhesion is } \frac{19,500}{87,500} = \frac{1}{4.49}.$$

The usual method of computing train resistances being to allow 10 or 10½ lbs. per ton, while I have above stated the wheel friction at only 6 lbs. per ton, it may be well to explain how it is arrived at.

In 1854 the late Mr. Zerach Colburn made a number of careful experiments on the Erie Railway, from which he deduced the conclusions that the resistance from wheel friction upon a straight line was $\frac{1}{4}$ lb. per ton, and on curves $\frac{1}{4}$ lb. per degree in addition.

The train which he experimented with, however, was specially prepared for the occasion, and more perfect in lubrication and fitting of journal bearings than those met with in ordinary practice. We find, by recent experiments with a dynamometer upon the Erie Railway, that the wheel friction of ordinary trains on a straight line is generally $\frac{1}{4}$ lb. per ton, but we call it 6 lbs. to be safe. We find also that the additional curve resistance is as near as may be $\frac{1}{4}$ pound per ton per degree, as stated by Mr. Colburn.

The atmospheric resistance varies, of course, with the square of the speed, or nearly so, as it is mainly composed of the end pressure, varying as the square of the speed, and the friction of the air upon the sides of the train, which, in consequence of the gaps between the ends of the cars it is difficult to estimate accurately. We found that with two empty freight cars, at 30 miles an hour, the atmospheric resistance was 700 lbs., and with 20 empty cars at the same speed it was 900 lbs. In the first instance it was, therefore, 35 lbs. per ton, and $4\frac{1}{2}$ lbs. per ton in the second. But if the cars had been loaded it would have been no more in the aggregate, and expressed in terms of the tonnage, would have been $17\frac{1}{2}$ and $2\frac{1}{2}$ lbs. per ton respectively.

As the end surface of a car is about 100 square feet, and the air pressure due to a speed of 30 miles an hour is 4.43 lbs. per square foot, it will thus be seen that the atmospheric end resistance was 443 lbs., while the remaining 257 lbs. in the first case, and 457 lbs. in the latter case were due to the friction against the sides and the pressure against the partly uncovered ends of the cars succeeding that on the front end of the trains. For ordinary loaded trains, consisting of 25 to 40 loaded cars, we usually allow from 2 lbs. to 1.20 lbs. per ton for atmospheric resistance, at speeds varying from 15 to 25 miles per hour.

To the question asked by one of the members present, as to what gradient is required to work a railroad by gravity, I would answer, that if the wheel friction is correctly stated at 6 lbs. per ton, the equivalent angle of repose would be 0.30 per 100 ft.; or 16 ft. per mile on a straight line. The curves adding a resistance of a half pound per degree, would, if ruling at 4 degrees, or 1,432 ft. radius, add 2 lbs. per ton to that on a straight line, or 0.10 per 100 ft.; thus making

$$\frac{(6 + 2) 100}{2,000} = 0.40 = 21.12 \text{ ft. per mile,}$$

while, when we take into account the atmospheric resistance at 25 or 30 miles per hour, and the expediency of having a surplus power (to be controlled by brakes), in order to start the cars promptly, and to get the trains out of the way of those following them, we find that in practice we need gradients of about 40 ft. per mile to work trains by gravity, which corresponds to a resistance of 15.2 lbs. per ton, or 0.76 per 100 ft.

Train-Brakes for Freight Trains, and the Dangers of Train-Men.

[Proceedings of the regular monthly meeting of railroad men and others, at the rooms of the Master Car-Builders' Association, New York, Thursday evening, March 20, 1879.]

THE PRESIDENT (Mr. Leander Garey)—Gentlemen, the subject for discussion this evening is train-brakes for freight trains.

No railroad man need be in the dark as to the desirability of our freight trains being placed under the control of the engineer. We have a committee appointed to investigate this matter and make their report at our next annual meeting in June. I think the chairman of that committee is present this evening, and I would ask him to present this subject.

MR. C. E. GAREY—Unfortunately for me, I presume, I am chairman of that committee. It really does not seem, after all that has been said on the subject, that there is any necessity for presenting any argument in favor of, as our President has well said, the desirability of a train-brake for freight trains.

The thing has been gone over repeatedly. The idea that a man, on the roof of a car that is all covered with ice, in the dark, is going to do much toward putting on a brake to stop a train is well understood, and if he gets where a brake is he is very liable to stay there—at least, I think I should, if I were in that condition.

That being the case with a train of cars with a brakeman for each eight or ten (which, I believe, is the usual allowance), a train of forty cars would have four brakemen (and generally all cars are equipped with only single brakes), and one of the brakemen would get brakes on only four wheels out of every forty, or rather every eighty wheels. When such is the condition, anybody that has any idea of braking a train knows very well that it is simply impossible to stop a train running at a speed, say of from ten to twelve miles an hour, with any degree of certainty to avoid accidents. The result is, accidents are not avoided, and if there is any obstruction on the track within half a mile of this train it is pretty sure to run into it. There is consequently a "smash-up," and the

property destroyed. Frequently one such "smash-up" would equip a railroad with a good train-brake.

Again, it is asking a good deal to presume that a man is going to do any more than that on the roof of a car.

We can work only one brake, unless there happens to be two brakes together, so that he can jump from one car and catch at the brake on another, because there is nothing else to catch at; in which case he may be able to get it on two cars; and then again, last winter many a poor fellow was frozen to death, and a man that was frozen to death could not do much toward putting on the brakes.

So that for humanity sake as well as for saving property, it would seem to be less expense that some other means should be devised to brake trains without putting a man on the roof of cars.

Now, if you are going to have anything else, what better man do you have on your trains than the engineer in whose hands to place the brakes when the brakes are needed? He is not exposed as brakemen are to cold, because he has a good fire by him. He can see as far ahead as any other man, because he has the advantage of position, and so it would seem to be the logical conclusion that the train should be placed under the control of the engineer. That, I presume, is granted by every one.

Then the next thing to look to is a train-brake that can be applied to our rolling stock as it now exists.

We have a variety of brakes offered, but the majority of them have so much machinery attached to them, and the necessity for having all the cars equipped with the brakes seems to make it almost out of the question to apply such brakes. Then the great difference in the height of draw-bars, the great difference in the construction of cars, all tend to make it difficult to apply a train-brake to freight trains.

I had a letter from a gentleman the other day, in answer to inquiries in regard to a train-brake he had, and I found it was simply a hand brake, and I, in answer to his letter, told him that the great question now was a train-brake under the control of the engineer applicable and operative on each car in the train independent of any other car, without any extra coupling between the cars. Our company has maintained from the start, that in order to apply a train-brake it was indispensable that a brake should be on one car and work on that car without any regard to any other car in the train. This gentleman wrote me that the idea of a brake operative and applicable on each individual car, without regard to any other cars, was simply preposterous, and could not be done. But, gentlemen, I believe and have always contended that it was not an impossible thing. Why, look at it. When we think of talking hundreds of miles and being heard; when we look at the telephone and see how marvelous a thing it is, it does seem to me that hardly anything is out of the range of possibility, if brains will set to work at it. And, as a result of the agitation of this question, there is a brake (I think it is called the Stewart brake) that comes the nearest of anything to the requirements laid down by the committee; and just as soon as that or any other brake carrying out the same idea can be invented, which I have no doubt it will be (and there is a good many here will live to see our freight trains equipped with some such device), trains can run, instead of 12 miles an hour, 25 miles. It requires no more men, nor as many, to manage the trains, and it will reduce the running expenses of a road 25 per cent.

THE PRESIDENT—Has any one present any data as to the power that is exerted by a man on the ordinary windlass in general used now on our freight cars?

MR. C. E. GAREY—I have made a little experiment on my own account to find out something about that matter, and I found out of twelve men braking on the roof in the usual manner that the power applied was strained on the chain of the brake, running from 523 to 912 lbs., or an average of 700 lbs. Then to find whether there was any difference in braking from the roof or the platform of cars, I applied my machine to a platform car and found that the poorest man on the platform was as good as the best man on the roof; or men that would apply a power of 523 lbs. on the roof, would apply 912 lbs. on the platform, and it ranged from 912 lbs. and some over to 1,400 lbs., or an average of 1,150. So that one man on the platform, taking all things into consideration, I should conclude to be worth about two men on the roof, provided he had the cars so he could get at the brakes.

THE PRESIDENT—At our meeting last month the subject tended somewhat to take in the train-brake question. It was thought best to ascertain how much distance there was between the roofs of the cars and the running boards as they were in trains—the distance that a man would have to jump from one car to another. I had several cars measured to get at the distance between the manufactured cars and cars owned by the different roads. I find that the least distance left was 21 in. and the greatest distance 43 in. The Pennsylvania Railroad cars, so far as I was able to get at it, would average 43 in. between the cars. The Great Western Railway of Canada runs from 32 to 34 in. between the cars. The Boston & Albany and the Lake Shore and the Michigan Central range from 31 to 33, and the New York Central from 28 to 31.

MR. C. E. GAREY—There is another thing, Mr. President. The brake-stems on the different cars vary a good deal in size, that is to say, from one and a quarter inches to an inch and a half, and we frequently find large-size wheels on the small-size stems and small-size wheels on the large-size stems, making an enormous difference in the leverage of the wheel.

THE PRESIDENT—There would appear to be no difficulty in making the application of the compressed-air brake on roads which do a local business, whose cars are all the time at home, but in this extensive interchange it will be a difficult matter to make up a train without having the cars of from ten to fifteen different companies in. In fact, I think the New York Central Railroad passes cars over their line owned by between three and four hundred different parties. I think it would be necessary to have a brake that would be applicable to a part of the cars in a train, and operative when separated, to be a success. As has been said, there is no question but a good brake on the tender and the drivers would be equivalent to all the brakemen that are carried on our freight trains, and I think, ordinarily speaking, would be worth double the number of brakemen that are carried on the trains.

MR. VARNER—I agree with our President that brakes on the engine could do double what the men on the train do.

THE PRESIDENT—A very prominent railroad man was in my office not many days since, and stated that he would place driver-brakes on a locomotive handling a freight train to be equivalent to the brakes applied to fifteen cars on the average as applied by the men at present.

You understand there is but few of the eight wheels on a car that the brakes are applied to on freight trains, so that fifteen cars would be equivalent to seven and a half.

MR. GOLDSMITH said he travels 35,000 miles a year, and has been doing so for the last ten years, and, consequently, has had abundant opportunities to observe the working of trains. He said he had made several patterns of suggested improvements, but has not got them in shape yet to bring out in a model, but hopes to be able to present them to the Association in June.

THE PRESIDENT—At our last meeting, when the safety of train-men was the subject, it was suggested by Mr. Kirby, of

the Lake Shore road, that there be a step on the lower ladder round for the foot of the brakeman, to allow him to climb more readily.

I notice quite a good many cars since then that have that device, and I think it is a very good thing indeed. It assists the brakeman in getting up on his car very much; he puts his foot upon the lower round with the assurance that it will not slip off. I also noticed a few cars with an extension of the running board six or eight inches, bringing the cars sixteen or twenty inches nearer together. I also saw one car with a gas pipe fitted on the top of the car running its extreme length sufficiently for a man to get hold of in passing along the car.

MR. SMITH—There is no doubt in my mind but a train-brake for freight trains will do more to help train-men or make train-men efficient when trains are running in bad weather or any other than anything else. But manufacturers of train-brakes must have a little encouragement from the railroads when they do get a good reliable brake. I think that is where the greatest difficulty will be found. If railroad companies will encourage a really good brake, manufacturers would feel more like trying to give them a better one. But my impression is that there is nothing that would tend more to the safety of train-men than a good train-brake.

MR. CREAMER—I think, as Mr. Smith suggests, that if railroads will encourage inventive men more something will come of it. But there is one thing in that connection that I have thought of for 25 years past, and I don't know of anything that pleased me more than in reading in the *Railroad Gazette* the report of the last meeting, when the safety of train-men was brought up, and I was very much interested with the suggestions that were made. There is nothing that impresses me with so much force as the great risk that train-men are subjected to. In the first place, the coupler of the cars that was used 25 years ago, and is substantially the same thing to-day, is absolutely barbarous. I do think that if the superintendents and presidents and directors had to do a little of that coupling themselves, in a very short time something would be devised.

Then, again, the running board of the cars is a matter that I have thought of a great deal, and it seems to me it would be a very easy thing to build a little platform at the end of it; and I think the running board, instead of being about 10 in. wide, ought to be about 18 in. wide, and I think if there was an iron post put up, if the tunnels and bridges would allow it, it would be a good thing.

Now these things cost but a mere trifle, but they would promote the safety of train-men, and I think the officers of the railroad company would promote their own interests by doing it.

I think the manner of arranging the bell-cord on freight trains is abominable and, in nine cases out of twelve, useless.

Now as to the matter of train brakes.

It occurred to me while sitting here whether it would not be a good idea to take about three of the cars of every train and connect the brakes with a chain, so the man in the caboose could operate the brakes of four or five cars. Would it or would it not be practicable on a railroad to have four or five of the cars connecting with the caboose fixed with a continuous chain brake that can be operated by a windlass in the caboose? It seems to me that would facilitate the stopping of the train very much and would be a step in the right direction. I think the difficulties in the way of the general adoption of any uniform system of train-brakes are so perfectly appalling that you will find hardly anybody will undertake to do it, but if you could make a step in the right direction toward it by proving the efficiency of the brakes on the locomotives and also in the caboose by two or three of the cars that connect them, that would be a step in the right direction. My own thought about the matter of train-brakes has been that the first step would be the adoption of a safety brake. It seems to me that it will accomplish the result with the least possible expense, and would be a movement in the right direction.

THE PRESIDENT—I do not think any one would question the wishes of railroad men and the willingness of the financial management of railroads to have this duty performed, and I should be more apt to expect censure from them than that it was not already done. Now it is necessary for the man who has charge of this work, as fast as the necessity appears for improvements of this kind, to see that they are made, and the gentlemen that are present, who may come in contact with others, would be doing themselves and other companies, and the community at large, through the train-men, a great favor by agitating this matter, not only to see that it is applied on the cars which they have control of, but applied to the cars of others whom they may come in contact with.

My friend Creamer is an inventor, and he, of course, defends the idea that railroad companies ought to encourage inventors, and I agree with him; but take the draw-bars and see the hundreds of inventions that have been patented, perhaps running up into the thousands; and then the few inventions for putting the trains under the control of the engineer or conductor, or both, and it would seem to me as though inventive genius ought to be trained a little in that direction.

MR. CREAMER—On the English freight car (I don't know whether the gentlemen here are familiar with it), the foot of the bunker presses into a spring which is also connected with the draw-bar running through.

(Mr. Creamer illustrated by a drawing on the board.)

The brakeman who couples those cars has a clear space.

I have seen men in between those cars when the cars were coming together. I should think, at a speed of two miles an hour, and you think the man is about to be smashed to pieces; but he has an open space, and he couples the cars with the utmost safety. I see no reason in the world why our cars could not have more space in between, or something so that a man would not run so much risk as he does.

THE PRESIDENT—I would say that I know several roads which have increased the thickness of what is termed the deadwood to six inches. The old thickness was 4 or 4½ in.

This is a matter that I would like to impress upon some of the gentlemen present who, I think, have advocated a device which has been termed by some very hard names. The old style "man-killer" should be done away with. This is a subject that cannot be agitated too much.

MR. SMITH—I have been an advocate of what are termed "man-killers," but the last two years I have been making inquiries of train-men and yard men as to which they prefer, and the invariable answer was those without bumper blocks. I advocated the bumper blocks while railroading, but now that I am out of it I think I had better advocate what is best for the brakemen. I have no doubt myself that the bumper block without the deadwoods is far better for the safety of train-men than with the deadwoods on them. But the deadwoods are certainly a protection to the car.

The meeting then adjourned.

—Mr. John V. Norton, a graduate of Union College, for some years a civil engineer on the Erie Canal and later on the Lima & Oroya Railroad in Peru, died of yellow fever in Rio Janeiro, Brazil, Feb. 11, aged 39 years.

Report of Car-Wheel Service in 1878, Pittsburgh, Cincinnati & St. Louis Railway.

PITTSBURGH, CINCINNATI & ST. LOUIS RAILWAY COMPANY, P. C. & ST. L. DIVISION.

Mileage of wheels, per 1,000 lbs. weight carried by each, drawn during 1878.

33-IN.				
KIND OF SERVICE.	No. drawn.	Average mileage.	Av. weight on journals.	Miles run per 1,000 lbs. wt. on journals.
Pullman car.....	98	44,083	4,800	9,184
Passenger car.....	677	47,081	3,955	11,904
Passenger engine.....	36	31,309	5,916	5,307
Freight.....	258	40,401	5,395	8,600
30-IN.				
Passenger engine.....	4	44,535	5,916	7,528
Freight.....	6	48,407	5,395	8,089
28-IN.				
Passenger engine.....	32	18,298	5,916	3,063
Freight.....	53	34,010	5,395	6,304
26-IN.				
Passenger engine.....	9	26,165	5,916	4,423
Freight.....	53	34,740	5,395	6,439
24-IN.				
Passenger engine.....	2	36,501	5,395	6,765
Freight.....	2	36,501	5,395	6,765

PITTSBURGH, CINCINNATI & ST. LOUIS RAILWAY CO., P. C. & ST. L. DIVISION.

Annual Statement of Wheels drawn in Passenger and Motive Power Service in 1878.

Engine Truck, 24 in.				
Average mileage.....	36,501			
Total mileage.....	73,002			
No.....	2			
Engine Truck, 26 in.				
Average mileage.....	37,073			
Total mileage.....	74,146			
No.....	2			
Engine Truck, 28 in.				
Average mileage.....	38,480			
Total mileage.....	76,960			
No.....	2			
Engine Truck, 30 in.				
Average mileage.....	40,401			
Total mileage.....	80,802			
No.....	2			
Tender Truck, 33 in.				
Average mileage.....	41,535			
Total mileage.....	83,070			
No.....	2			
Passenger, 33 in.				
Average mileage.....	47,081			
Total mileage.....	94,162			
No.....	2			
Pullman, 33 in.				
Average mileage.....	44,083			
Total mileage.....	88,166			
No.....	2			
Freight, 33 in.				
Average mileage.....	40,401			
Total mileage.....	80,802			
No.....	2			
Deadwood.				
Shelled on tread.....	4	473,074	118,398	
Combings.....	15	1,092,688	72,865	
Seams in tread.....	3	148,302	49,400	
Worn hollow.....	94	7,240,328	77,024	
Flat from sliding.....	265	13,149,545	36,028	
Worn flat.....	12	650,240	54,168	
Cracked.....	10	312,390	62,319	
Bursted.....	5	306,386	38,028	
Cracked.....	10	343,350	47,193	
Broken flange or tread.....	25	484,343	19,373	
Good for passenger.....	11	576,962	32,454	
Good for freight.....	50	2,205,612	44,112	
Total mileage of all wheels drawn.....	75	2,505,035	34,000	
Total mileage of all wheels drawn, except "good for pass.".....	67	4,320,129	44,083	
Total mileage of all wheels worn out.....	87	3,743,137	43,024	
Total mileage of all wheels worn out.....	12	1,148,102	95,075	

"Worn out" does not include "Flat sliding" or "Good for Pass."

COMPARATIVE MILEAGE.									
MAKER.	Total wheels condemned.	Total average mileage.	No. wheels con'd.	Av. mileage.	Greatest mileage.	Least mileage.	Repl'd.	No. of miles.	Diameter, No. con'd. Av. mileage.
PASSENGER.	16	1	1	1	1	1	1	1	1
PULLMAN.	1	1	1	1	1	1	1	1	1
MAKER.	775	40,702	98	41,083	47,081	412	50	50	50
Total	775	40,702	98	41,083	47,081	412	50	50	50

The number of wheels replaced in "Passenger" includes those condemned in 1877, but not replaced until 1878; also wheels condemned in "Freight" account not running guaranteed time.

The number of wheels replaced in "M. P." includes those condemned in 1877, but not replaced until 1878.

Transportation in Congress.

In the Senate on the 24th:
 Bills were introduced as follows:
 By Mr. Beck, of Kentucky—Providing for the settlement of accounts with certain railroad companies.
 By Mr. Coke, of Texas—To promote interstate commerce and to prevent unjust discriminations in freight by common carriers. (Probably a revival of the Reagan bill.)
 By Mr. Kellogg, of Louisiana—To secure complete railway communication from Fort Black to El Paso.
 By Mr. Johnston, of Virginia—For the construction of the Washington, Cincinnati & St. Louis Railway from tide-water to St. Louis and Chicago.
 By Mr. Plumb, of Kansas—To settle with certain land-grant railroads in accordance with the decision of the Supreme Court of the United States, and prevent further litigation.

Resolutions of the National Passenger Agents' Association.

Near the close of the recent session the following resolutions, which were not published in our report, were adopted or referred:

Resolved, That the General Committee be instructed to select from the records of the General Passenger and Ticket Agents' Association all resolutions that, in their opinion, are pertinent to and of interest to this Association, and have them arranged in form for presentation to this Association, at its next meeting, for consideration.

Resolved, That the Secretary's salary be fixed at five hundred dollars per annum, to be collected as provided in the by-laws.

Resolved, That the Secretary be authorized to procure a case to hold all tariffs so that he can bring them to the meetings of the Association.

Resolved, That on and after May 1, 1879, each and every company represented in this Association will not check free, nor allow to be checked free over its line or any portion thereof, more than 150 lbs. of baggage on each first-class, second-class, emigrant, theatrical, commercial or other kind of ticket. This rule to apply to "local" as well as "through" tickets.

Resolved, That between competing points and on all through business, the excess baggage rate per 100 lbs. shall be 15 per cent. of the lowest regular first-class unlimited ticket fare from starting point to destination; and all excess collections shall be reported to connecting lines on and after May 1, 1879, at the same time, and upon the same basis as regular ticket divisions.

After some discussion the above resolution was referred to the General Committee for report at the next semi-annual convention.

It was deemed expedient to refer all matters that had been referred to the old Association by the Central and Western Associations, to the General Committee, and it was thus ordered by the chair.

Resolved, That this Association sanctions the rules and regulations of the district associations on the subject of excess baggage.

Resolved, That the rule now on the old rate sheet regarding the age at which children shall be carried free, the amount of free baggage adopted by district associations, and Section 8 of the by-laws be printed on the outside page of the new rate sheet.

Resolved, That the Secretary be instructed not to publish the names of movers of resolutions in the printed copies of the proceedings, but that the names of movers shall appear in the minutes of the Secretary.

Resolved, That parties publishing monthly rate sheets be

requested to insert the "day's limit" in said sheets, to conform to the rate sheet of this Association.

Resolved, That the limitation of west-bound emigrant tickets be 24 hours only beyond schedule time, that this limit be the same as on first-class limited tickets, and that the limit be inserted in the rate sheet.

Resolved, That the Secretary confer with Mr. Samuel Powell, ex-Secretary of the old Association, and request him to publish the proceedings of the old Association up to the hour of its dissolution, and collect the expenses of the same and his salary, in the usual manner.

The following was offered as an amendment to the Constitution:

"But no one individual in this Association shall be entitled to more than one vote, regardless of the number of roads or corporations he may represent."

Under the rules this was laid over until the next convention.

Test of Improvement by the Western Railroad Association.

The following rules have been adopted by the Western Railroad Association to govern examinations by experts of improvements. In the circular accompanying these rules, addressed to the members of the Association, Mr. Raymond, the Secretary, says:

"I take the liberty of suggesting that you refer any one who seeks to introduce any new device upon your road to these rules. It is desirable that this plan, when fully in operation, shall be the mode of presenting improvements to railroad managers."

At the annual meeting, Jan. 14, 1879, it was

Resolved, That the board of directors is authorized to appoint mechanical experts to examine into and report upon the merits of inventions affecting railroad interests, provided each inventor or other applicant pays to the Association not less than \$100 for each examination, and, in addition to the fees of the experts, the cost of making examinations and experiments, and the expense of printing the reports and distributing them among the members of the Association.

Pursuant thereto the Committee has adopted the following:

RULE I.—Parties requesting examinations of inventions, shall, in each case, file with the Secretary a written application for an examination, accompanied by a copy of the let-

ter patent, an abstract of the title, a certified copy of the file-wrapper and contents, a brief statement of the advantages claimed, and when the improvement will admit of it, a model thereof; and shall, at the same time, pay to the Secretary the sum of one hundred dollars (\$100), all of which shall be retained by the Association as its property.

RULE II.—In granting a request for any such examination, the Executive Committee may require, before the Examining Board shall proceed therewith, the deposit of such sum as will be required to meet the probable expenses of the examination.

RULE III.—Wherever the Executive Committee shall determine to proceed with any such examination, it will appoint a Board of Examiners and furnish them with such instructions as the nature of the case shall seem to require. The Secretary will then notify the members of the Board of their appointment, and name the time and place of their first meeting. The said Board will make its final report, in writing, to the Executive Committee, and the report will then be printed and sent to the applicant and to each of the members of the Association.

RULE IV.—If experiments are made, reasonable notice thereof will be given to the applicant.

RULE V.—The members of said Board shall be paid eight dollars per day, or in that proportion, for the time actually employed, and, also, their actual necessary traveling expenses.

By the Executive Committee,
 J. H. RAYMOND,
 Secretary Association.

CHICAGO, March 12, 1879.

Travers' Iron Tie.

At the regular monthly meeting of the Engineers' Club of Philadelphia, March 15, C. E. Buzby exhibited a model of Travers' iron railroad tie, which is being tried on the Philadelphia & Baltimore Central road, near Lamokin. The device dispenses with all spikes, bolts, nuts or fish plates and drilling or punching the rails, avoiding fractures from such causes. The iron tie, it is claimed, will outlast twelve renewals of the ordinary tie at one-half the cost to keep in repair. Each tie is recessed under its rails, and along the bottom of the recess wedge-shaped pieces are cast transversely. At the sides of each recess are cross-cut blocks, which form a cushion and a fulcrum for two clamps, which grasp the flange and web of the rail above, bearing upon opposite faces of the wedge below. The weight of the train forces the clamps upon the wedge, spreads them at the bottom and grips the rail. The first cost is somewhat greater than the wooden tie, but it is said to offset this in durability.

RAILROAD EARNINGS IN FEBRUARY.

NAME OF ROAD.	MILEAGE.					EARNINGS.					EARNINGS PER MILE.	
	1879.	1878.	Inc.	Dec.	P. c.	1879.	1878.	Increase.	Decrease.	P. c.	1879.	1878.
Atchison, Topeka & Santa Fe.	894	786	108	.....	13.7	\$379,500	\$184,885	\$194,615	.....	105.3	\$424	\$235
Burlington, Cedar Rapids & North.	434	424	10	.....	2.4	97,277	147,193	.....	.....	33.9	224	347
Cairo & St. Louis	146	146	.....	.....	.....	16,055	13,048	3,007	.....	23.1	110	80
Central Pacific	2,180	2,067	113	.....	5.5	1,003,000	980,328	122,472	.....	11.5	501	474
Chicago & Alton	678	678	.....	.....	.....	312,311	300,086	12,225	.....	4.0	461	443
Chicago & Eastern Illinois	159	159	.....	.....	.....	60,363	58,933	1,430	.....	2.5	380	370
Chicago, Milwaukee & St. Paul	1,729	1,414	315	.....	22.3	476,000	696,583	.....	190,583	28.0	275	471
Chi. & N. Western	2,159	2,078	81	.....	3.9	895,000	1,084,859	.....	189,859	17.5	415	522
Cleveland, Mt. Vernon & Del.	157	157	.....	.....	.....	24,490	27,212	.....	2,712	1.0	156	173
Galveston, Houston & Henderson	50	50	.....	.....	.....	43,948	33,900	10,030	.....	29.6	879	678
Hannibal & St. Joseph	292	292	.....	.....	.....	132,393	124,006	8,387	.....	6.7	453	425
Illinois Central, Illinois lines.	854	818	36	.....	4.4	379,377	380,048	.....	671	0.2	444	443
Iowa lines.	402	402	.....	.....	.....	95,800	131,339	.....	35,473	27.0	238	327
Indianapolis, Bloomington & Western	343	343	.....	.....	.....	91,086	93,150	.....	1,473	1.6	267	272
International & Great Northern	516	516	.....	.....	.....	146,950	112,120	34,830	.....	31.1	285	217
Kansas Pacific	673	673	.....	.....	.....	230,214	172,965	57,249	.....	30.5	351	257
Memphis, Paducah & Northern	115	115	.....	.....	.....	13,225	18,615	.....	5,390	29.0	115	102
Missouri, Kansas & Texas	780	780	.....	.....	.....	194,857	181,118	13,739	.....	7.6	248	230
Mobile & Ohio	327	327	.....	.....	.....	105,000	188,700	.....	21,100	12.3	314	358
Nashville, Chattanooga & St. Louis	349	349	.....	.....	.....	158,034	155,771	2,263	.....	4.5	424	440
Paducah & Elizabethtown	185	185	.....	.....	.....	21,901	27,072	.....	5,171	19.1	119	146
Philadelphia & Erie	288	288	.....	.....	.....	336,060	180,507	50,192	.....	31.3	823	628
St. Louis, Alton & Terre Haute	71	71	.....	.....	.....	43,002	35,157	8,845	.....	25.0	823	628
Bellefonte Line	685	685	.....	.....	.....	339,950	341,318	.....	1,368	0.4	619	482
St. Louis, Iron Mt. & Southern	530	530	.....	.....	.....	255,828	294,001	31,167	.....	13.3	502	444
St. Louis, Kansas City & North'n	354	354	.....	.....	.....	88,081	83,139	5,942	.....	6.7	251	233
St. Louis & Southeastern	297	297	.....	.....	.....	77,024	94,878	.....	17,854	18.2	327	430
Toledo, Peoria & Warsaw	1,042	1,042	.....	.....	.....	747,761	679,768	67,993	.....	10.0	719	652
Union Pacific	688	688	.....	.....	.....	328,011	294,635	33,376	.....	11.3	477	428
Wabash	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	17,523	16,800	663	.....	3.9	\$7,102,869	\$7,026,384	\$659,550	\$523,005	1.9	\$400	\$417
Total increase or decrease	.....	.....	663	.....	3.9	.....	.....	130,485	.....	1.9	.....	.....

RAILROAD EARNINGS, TWO MONTHS ENDING FEB. 28.

NAME OF ROAD.	MILEAGE.					EARNINGS.					EARNINGS PER MILE.				
	1879.	1878.	Inc.	Dec.	P. c.	1879.	1878.	Increase.	Decrease.	P. c.	1879.	1878.	Inc.	Dec.	P. c.
Atchison, Top. & S. Fe.	887	786	101	.....	12.8	\$695,000	\$359,483	\$335,577	.....	93.3	\$784	\$457	\$327	.....	71.6
Burlington, Cedar Rapids & Northern	434	424	10	.....	2.4	214,639	312,608	.....	\$97,969	31.3	495	737	.....	\$242	32.8
Cairo & St. Louis	146	146	.....	.....	.....	32,109	24,015	8,094	.....	33.7	220	164	56	.....	33.7
Central Pacific	2,180	2,067	113	.....	5.5	2,239,000	2,061,516	144,484	.....	6.9	1,026	1,022	4	.....	0.4
Chicago & Alton	678	678	.....	.....	.....	650,048	601,259	54,789	.....	9.1	968	887	81	.....	9.1
Chicago & East. Illinois	159	159	.....	.....	.....	128,530	123,894	4,636	.....	3.7	808	779	29	.....	3.7
Chicago, Mil. & St. Paul	1,729	1,414	315	.....	22.3	1,068,000	1,372,718	.....	304,718	22.2	618	971	.....	353	36.4
Chi. & N. W.	2,159	2,078	81	.....	3.9	1,939,230	2,162,748	.....	223,518	10.3	898	1,041	.....	143	13.7
Cleveland, Mt. V. Del.	157	157	.....	.....	.....	53,485	56,368	.....	2,883	5.1	341	359	.....	18	5.1
Galveston, H. & H.	50	50	.....	.....	.....	92,880	75,875	17,005	.....	22.4	1,858	1,518	340	.....	22.4
Grand Trunk	1,390	1,390	.....	.....	.....	1,532,082	1,601,062	.....	68,980	4.3	1,102	1,152	.....	50	4.3
Great Western	511	511	.....	.....	.....	728,793	878,010	.....	149,217	17.0	1,426	1,718	.....	292	17.0
Hannibal & St. Joseph	292	292	.....	.....	.....	267,816	259,140	8,676	.....	3.3	917	887	30	.....	3.3
Illinois Central, Ill. lines	854	818	36	.....	4.4	829,958	807,798	.....	22,160	2.8	972	1,052	.....	80	7.6
Iowa lines	402	402	.....	.....	.....	194,439	208,248	.....	71,809	26.8	489	607	.....	178	26.8
International & Gt. Nor.	516	516	.....	.....	.....	308,798	247,615	61,183	.....	24.7	598	480	118	.....	24.7
Kansas Pacific	673	673	.....	.....	.....	415,987	362,451	53,536	.....	14.8	618	539	79	.....	14.8
Memphis, Paducah & N.	115	115	.....	.....	.....	28,580	34,161	.....	5,581	16.4	248	297	.....	49	16.4
Missouri, Kan. & Tex.	780	780	.....	.....	.....	389,310	308,146	.....	8,164	2.2	495	507	.....	120	12.2
Mobile & Ohio	327	327	.....	.....	.....	355,000	460,782	.....	105,182	22.8	675	874	.....	199	22.8
Nash., Chatta. & St. L.	349	349	.....	.....	.....	315,312	333,577	.....	18,265	5.5	903	956	.....	53	5.5
Paducah & Elizabetht'n.	185	185	.....	.....	.....	47,062	54,839	.....	7,777	14.1	219	283	.....	63	14.1
Philadelphia & Erie	288	288	.....	.....	.....	449,747	401,003	48,744	.....	12.2	1,562	1,397	170	.....	12.2
St. Louis, Alton & T. H.	71	71	.....	.....	.....	92,422	75,232	17,190	.....	22.9	1,302	1,090	242	.....	22.9
Bellefonte Line	685	685	.....	.....	.....	673,979	716,830	.....	42,850	6.0	984	1,046	.....	62	6.0
St. Louis, Iron Mt. & So.	530	530	.....	.....	.....	523,050	469,260	53,790	.....	4.8	987	942	45	.....	4.8
St. Louis, K. C. & Nor.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Louis & Southeastern	354	354	.....	.....	.....	171,158	169,097	2,061	.....	1.2	483	478	5	.....	1.2
Toledo, Peoria & War.	237	237	.....	.....	.....	172,531	225,344	.....	52,813	23.4	728	951	.....	223	23.4
Union Pacific	1,042	1,042	.....	.....	.....	1,438,362	1,377,268	61,094	.....	4.4	1,380	1,322	58	.....	4.4
Wabash	688	688	.....	.....	.....	640,688	661,554	.....	40,866	6.0	931	691	.....	60	6.0
Total	19,417	18,761	656	\$16,877,053	\$17,305,417	\$840,088	\$1,269,052	\$809	\$922	\$53	5.5
Total inc. or dec.	656	3.5	428,364	2.5



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EDITORIAL ANNOUNCEMENTS.

Addresses.—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed EDITOR RAILROAD GAZETTE.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

THE ATLANTIC & GREAT WESTERN REPORT.

The annual reports of the Receiver of the Atlantic & Great Western Railroad have this great merit, that they tell the very painful truth about the productiveness of the property with great plainness and clearness. Painful the truth must certainly be to the proprietors of the road, who can count their holdings of stocks and bonds and unpaid coupons to the amount of \$120,000,000 or more. In the four years and 22 days of the receivership, the road has earned over working expenses, rentals of leased road and leased rolling stock, the sum of \$790,025.57. The only interest paid on the bonds of the railroad was \$373,278.45, which went in the first two years for interest on the Ohio first-mortgage bonds. For the other \$80,000,000 and more of bonds and for the stock the road has earned in these four years the magnificent sum of \$356,747.12. And even this they could not have. Improvements which were considered indispensable, though properly chargeable to capital, being additions to the property, have cost \$6,200 more than this surplus of net income. And there are no signs of improvement. On the contrary, 1878 was the worst year of the four. Net income over fixed charges paid was \$154,170.46 in 1877, but last year there was a deficit of \$19,960. The charges which the road has to pay are the rental of the Cleveland & Mahoning Railroad and of some little branches, amounting to \$303,000, and the payment for the use of cars and engines, most of which it hires from the United States Rolling Stock Company largely at a rent which depends upon the use made of the cars. The charges last year were \$335,500. On a fully-equipped road this service for which this company has to pay would be had from its own property. This expense is precisely similar to that for the rental of a leased road, and so is properly kept out of working expenses and placed with fixed charges. It is a fixed charge, however (like the rental of a leased road), which even a receiver

has to pay. The road cannot be worked without rolling stock, and the owners of rolling stock will not leave it on the road unless they get pay for the use of it.

This result ought to account sufficiently for the eagerness of the reorganization trustees of the Atlantic & Great Western Company to let their road to some one on almost any terms that will not require the bondholders to pay the debts which are prior to their own claims. It may also account for the forbearance shown by the Ohio first-mortgage bondholders. With a receiver's debt of a million over the floating assets which can be converted into cash, and an available income of \$20,000 less than nothing in the last year, they might well hesitate to foreclose their mortgage.

The year 1878 was in some respects exceptionally unfortunate for this road. It was terribly damaged by floods in August, and had to spend a hundred thousand dollars to repair the damages, to say nothing of loss by interrupted traffic. A hundred thousand dollars might not be a very serious matter to most roads that earn nearly four millions a year, but for the Atlantic & Great Western, which does not always have surplus net earnings equal to that sum, it is more than it can afford to lose.

So far as traffic is concerned, the year was favorable. The passenger traffic recovered from the great depression of 1877, and reached nearly the average of previous years. The freight traffic, it is true, was slightly (2 per cent.) less than that of 1877, but in the latter year it was much the largest in the history of the road; and in 1878 the freight was 15 per cent. greater than in 1876. Low rates are at the bottom of the trouble, for there was some decrease in expenses in spite of the floods. It is noticeable, however, that the average freight rate on this road in 1878 (0.835 cent) was not nearly so low as on the parallel Cleveland, Columbus, Cincinnati & Indianapolis (0.752 cent) for the same year, so that there are apparently still deeper depths into which the Atlantic & Great Western may sink. With the Cleveland road's rates it would have earned \$275,000 less, and could not have paid its rentals without borrowing. All the trunk lines, however, received higher average freight rates than the Atlantic & Great Western. This, like the Cleveland road, gets most of its freight earnings from its through freight, nearly two-thirds last year and more than two-thirds in 1877. The difference in the quantities of the two kinds of freight is very much greater. The local was but 22.8 per cent. of the whole in 1877 and 24.5 in 1878. The whole decrease in tonnage-mileage in the latter year was in through freight, there being a slight increase in the local. The passenger traffic in 1878 was just about equally divided between through and local, and the large increase since 1877 (15 per cent.) was almost wholly in local travel, which is remarkable.

This road penetrates or borders the petroleum districts of Pennsylvania and the coal-producing and iron-manufacturing district of Northeastern Ohio. Coal, ore and petroleum are very large items in its traffic. In 1877 they formed more than half of the total number of tons moved. But in every one of these items there was a decrease in 1878—4 per cent. in ore, 17 per cent. in coal, and no less than 42½ per cent. in petroleum. This enormous decrease in the oil business was doubtless due chiefly to the settlement of the conflict between the Standard Oil Company and the Pennsylvania Railroad. While that lasted, for six months of 1877, the Standard Company shipped nothing by the Pennsylvania's lines, and the carriage to Cleveland must have been thrown chiefly upon the Atlantic & Great Western. In 1878 it got only its share, and its share of a smaller aggregate business. But the rates were better—on the average one-ninth more per barrel. The decrease in earnings from these three items of freight was no less than \$344,622. The decrease in total freight traffic was \$42,000 less than this, so that we may assume that the other local freight and the through earnings from merchandise westward and agricultural produce eastward were larger than in 1877.

The future of the property, so far as the security-holders are concerned, will probably be provided for by the proposed lease to the New York, Lake Erie & Western, which will be especially favorable to the holders under the Ohio mortgage, who will get their arrears of interest and either their principal, or further security for their interest in future. But as to the prospects of the road itself, it is hard to see any chance for a very great improvement. Very likely the interest on the cost and the renewals of rolling stock bought will be less than the rentals now paid for the use of hired cars, and very likely, too, the improvements of the road contemplated will cause a saving in expenses much exceeding the interest on their cost. But it must be remembered that the road is al-

ready cheaply worked. The cost per ton per mile is less than on the Erie. Could it be reduced as low as on the parallel Cleveland road, the gain after all would be but \$275,000. The average length of haul is, however, about one-half longer on the latter road, and the average freight-train load being about the same on both (97½ and 99 tons), that road ought to be more cheaply worked when the two are in similar condition.

Expenditures for improvements are kept carefully separate from maintenance expenses in the Receiver's report, but, as we have often shown, the latter, when keeping the road in perfect repair, do not always represent the average depreciation from wear. In 1878 the renewals would appear to have been about 5 or 6 per cent. of the rails in track, which, as the road is mostly still of iron, cannot be equal to the average wear.

Something is to be expected from the new Pittsburgh connection, which will enable this road to compete for an important traffic which heretofore it has been unable to reach, and a change of the gauge to the standard will somewhat reduce the cost of through traffic and remove an objection to shipping by this route, which may enable it to get more of this traffic, though, as things go, it is questionable whether that will be any advantage. A road which makes so little from its total traffic can hardly be making anything out of its through traffic—at least not out of its through traffic eastward. This may change, it is true, and a very little advance in average rates would increase materially this road's net profits. But at present it is certainly unsafe to count upon such an advance. When the railroads have agreed upon a basis of 20 and 25 cents per 100 lbs, from Chicago to New York, as they have done this week, weeks before the opening of navigation, such a line as the Atlantic & Great Western can afford to be indifferent as to the amount of such business that it may get.

Considering the extremely narrow margin of earnings over expenses on this road, its lack of rolling stock of its own, the large proportion of iron rails in its track, and the comparatively light loads that it is possible to haul over it, the cheapness with which it is worked is very creditable to its staff of officers and men. Indeed, there are very few roads anywhere with a similar bulk of traffic that are so cheaply worked. It is a heavy freight carrier, however, having about half as much per mile of road as the Erie, and only about a third less than the Lake Shore. It is about equal in this respect to the Cleveland, Columbus, Cincinnati & Indianapolis, with a trifle more passenger traffic (per mile of road) and in 1877 more and in 1878 less freight traffic. There are no roads west of Chicago that report nearly so large a freight traffic (the Rock Island, the Chicago & Alton, the Northwestern and the Union Pacific not half so much in 1877), but it is and will always remain impossible for the roads crossing Ohio, whose traffic is largely or chiefly through freight, to get the rates of these Western roads. They get and will continue to accept trunk-line rates for most of their traffic, and their charges for this traffic are governed by those of the roads which have the heaviest traffic and lightest expenses of any in the country or perhaps in the world.

Immigration to the West.

The increase of the area of land under cultivation in this country, as indicated by the immigration and sales of new land, has been frequently referred to heretofore. Some time ago, the New York Tribune compiled a statement of the government sales and the sales of 20 land-grant railroads for a series of years, by which it appears that from 1872 to 1878, exclusive of sales in Texas, the quantities sold have varied from 4,562,000 acres (in 1875) to 10,512,000 (in 1878), and that the sales of last year were nearly as great as those of 1876 and 1877 together. We exclude the Texas sales because they are not given for three years out of the seven, and also because they are reported suspiciously large—3,500,000 acres in 1878. In Texas the public land is owned by the State, which has given titles to a very large part of that not yet occupied, and the warrants are in the market and many transfers are made of which no record can be had, any more than of the other sales of occupied land in the country. But in the rest of the country, in the Northwest, the private holdings of new uncultivated agricultural land are comparatively small, and when an immigrant buys raw prairie to make a farm of, in the great majority of cases he gets his title either from the government or from a railroad company.

The 10,600,000 acres sold in 1878 would make 662,500 farms of 160 acres, which is probably above rather than below the average.

This exceptionally heavy immigration to the West is at a time when immigration to this country from

Europe is exceptionally light. It is therefore evident that the makers of new Western farms are chiefly Americans (that has always been the case), and that there has been a check to the diversion of the people from agriculture to other industries. Agriculture has always made rapid progress, but up to 1873 the cities and towns of the United States were growing very much faster than the country, and the disproportion between agriculture and manufactures was being reduced. Now, as the other industries have ceased to grow, or grow more slowly, the increase of the population is compelled to find occupation and subsistence where they are sure of finding them, on the fertile unoccupied lands of the West, which give us what no European country has, an outlet for all unemployed labor.

There thus seems to be taking place a sort of readjustment of industries such as is likely to follow every period of financial distress, such "hard times" being largely caused not by general "over-production," but by misdirected production—too much butter for the bread, too many wagons for the horses, too much railroad for the traffic, etc.

It is often said that there cannot be too much production, and, taken generally, that is true. Mankind will always want more than it can get. But it is entirely possible to make more iron than the world wants. If every one had a watch, there would be little use in making so many that there would be two for every one. There is such a thing as having too many houses and too much bread. A man cannot easily consume more than two barrels of flour a year. Should the farmer prepare to raise three barrels for every one, he would waste his energies. But we will be glad to have the value of the third barrel in something else the farmer can raise—apples or chickens, or hops or wool. He soon finds this out, and as he can change his crops in a year, his business regulates itself pretty well, and what he produces gets consumed at some rate or other, and he almost never abandons the cultivation of his land because of "over-production," as the pig-iron producers blow out their furnaces.

Now it appears that the world is provided with works sufficient to produce about three times as much iron in a year as the world has ever consumed in a year; and it also appears that there have been years when the world has consumed too much iron—more than it could digest, as it were. Now a very large force has been trained to produce iron in these works—not enough, doubtless, to keep them all busy at the fullest capacity, but certainly more than are needed to produce all the iron that the world has any use for. The excess in the force of iron-workers and miners and workmen of hundreds of other kinds has reduced the production of things that the world does want and will consume if it can get them. It took a long time to train them for the employments in which they were superfluous; it may take a long time also to train them for the occupations where there is room for them. But even that is not the worst of it. It is first necessary to discover those occupations. Suppose that I was a coal miner in 1873, and was already convinced that there was too many of me, and would be for years. What then should I turn my hand to? That is just what I did not know, and that nobody seemed to know. If the capitalists had known they would have put their money into it (such as had any left that they could get at), and there would have been a demand for my labor. Instead of that there has been a season of painful waiting and groping by both laborers and capitalists. At last nearly every body seems to be busy again. But in several prominent industries (taking the whole civilized world, not the United States alone), the number employed is smaller than in 1873, and the army of boys that have grown to be men meanwhile have mainly kept out of the overstocked employments—that is, they have learned the occupations in which there was something to do. In this country, evidently, a very large share of them have gone to farming. They are preparing to increase still further the already vast surplus of grain, meat and cotton over what this country can consume. Their efforts serve chiefly to increase our exports, for there is not much that they raise which this country is not already abundantly supplied with, so far as its own consumption is concerned. The new settlers in Nebraska and Western Kansas and Colorado are going to grow corn and wheat and hogs and cattle to feed people in Europe. If they had turned cotton-spinners or iron-molders, or miners of coal or iron, they would not have added to the export trade, but would probably have diminished the import trade.

Again, the workman who turns farmer is likely to produce a greater bulk of freight than in his old occupation. This is not always true. A miner may produce many times as much as a farmer. But most workmen are engaged in changing the form of ma-

terials rather than in producing any new ones. He creates values, not matter.

Now it appears from this that the present increase in the farming industry will make special demands upon the transportation industry. The new lands are 1,500 miles or more from the sea, the products are bulky, and most of them (or others which they will take the place of) must be sent not only to the Atlantic, but across it, to find consumers. The Kansas farmer is likely to require three times as much service from the carrier for marketing his products as the Ohio farmer, and many, many times as much as the Massachusetts cotton operatives. Indeed, the chief part of the value which the Kansas products have in the markets where they are chiefly consumed is likely to be added by the carrier.

But while the great immigration means more work, and a great deal more, for the railroads, lake vessels and canal boats, it does not by any means indicate more pay in the same proportion. Unfortunately, grain cannot pay much more than bare cost for 1,500 miles of land carriage and 3,000 miles more by sea. Cattle and meat can do a little better, but not very much. If the roads nearest to the new farms get a fair support, then those farther east must be satisfied with a heavy contribution of new traffic and a very slight addition to net profits. The traffic in the other direction can be made to pay, however, and in course of time a great increase of farming west of the Missouri will cause a considerable increase in other industries east of the Mississippi. The first result, however, is likely to be a considerable increase of the non-paying traffic.

Profits of Passenger Traffic.

The cost of passenger traffic, especially of through passenger traffic, has been much complained of of late years as excessive, making the business unprofitable. Moreover, it does not greatly decrease as the freight cost does. But the price received for freight has fallen so much faster than the expense that the passenger traffic on many lines has become the most profitable. A good deal depends on the manner in which the expenses are distributed between passengers and freight, it is true, and that we have to take as we find it reported. For 1878 the Cleveland, Columbus, Cincinnati & Indianapolis reports its profit per passenger per mile as fourteen times as great as its profit per ton per mile, and its total profit from passengers was a fifth more than from freight, though the freight traffic, according to our basis of comparison (2 ton-miles = 1 passenger-mile) was nearly six times as great as the passenger traffic, and the freight expenses five and a half times the passenger expenses. The Atlantic & Great Western shows a very similar result. The profit per passenger-mile is eight times the profit per ton-mile, and the total profits from passenger traffic are but a ninth less than those from freight traffic, though the latter traffic is four and a half times as great as the former. The trunk lines do not show so great differences—partly because they get a little less for carrying passengers and a little more for carrying freight.

On the Pennsylvania's whole system east of Pittsburgh and Erie the profit per passenger-mile was but one-half greater than per ton-mile in 1878. This, however, includes one line (the Philadelphia & Erie), on which there is no profit but a small loss from passenger traffic. On the "Main Line and Branches" the profit was 0.435 cent per ton per mile, and 0.564 cent—30 per cent. more—per passenger per mile. The expenses per passenger-mile, however, is reported at a quarter more than on either of the Ohio roads, notwithstanding the immensely heavier traffic of the Pennsylvania. Less than a sixth of its gross earnings and little more than a tenth of its net earnings were from passengers. On the New York Central & Hudson River, for the year ending with September last, the profit per passenger-mile is given as just two and a half times as great as that per ton-mile—0.78 cent to 0.33 cent. On it the expense per passenger-mile is given as a little less than on the Ohio roads, and nearly a third less than on the Pennsylvania. It has a much larger traffic than any of the others—five times as much per mile of road as the Ohio roads.

Put in another shape, the proportion of expenses to earnings of freight and of passenger traffic separately have been reported as follows by different roads:

	Passenger.	Freight.
New York Central & Hudson River.....	62 p. c.	64 p. c.
Pennsylvania—all lines.....	74 p. c.	60 p. c.
" main line and branches.....	76 p. c.	52 p. c.
Atlantic & Great Western.....	61 p. c.	87 p. c.
Cleveland, Columbus, Cincinnati & Ind.	50 p. c.	87 p. c.

Doubtless much in these differences is due to differences in the methods of dividing expenses. Taking a passenger-mile and a ton-mile together, the variations in expenses are not nearly so great. Thus the New York Central does this work at a cost of 1.878 cents,

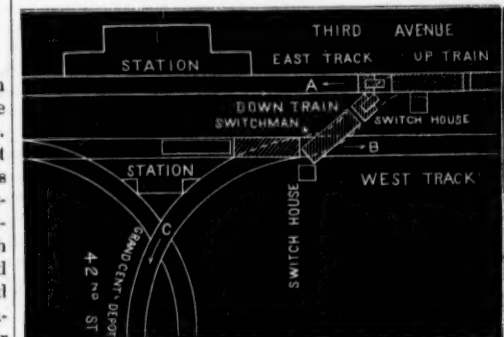
against 2.276 cents on the Pennsylvania "Main Line and Branches," 2.110 on the Atlantic & Great Western, and 2.065 on the Cleveland road. Cheapness in freight traffic, is, however, very much the most important, because it is very much the largest traffic on all the roads. But since passenger rates are maintained so much the best, the value of a road, and especially the stability of its profits, depends more and more upon the amount of its passenger business. Passenger business does not grow much, but it can almost always be counted upon to leave a profit; but roads frequently see their freight traffic increase enormously in amount and yet yield less and less profit from year to year. In 1873, for instance, the Atlantic & Great Western earned net about \$840,000 from freight; in 1878, with 30 per cent. more freight traffic, its freight profits were but \$360,000.

An Accident which Ought not to have Happened.

About noon, on Tuesday last, a collision occurred on the New York Elevated Railroad at the junction of its Third Avenue line with the Forty-second street branch. The cause is assigned to a misplaced switch, which, as one of the daily papers said, the switchman "inadvertently" set wrong.

The accident is described as follows in the New York Herald, from which the diagram is also copied:

"As will be seen by the accompanying diagram, a train from down town, bound for the Grand Central Depot, had been switched from the up or east track across to and off the down or west track and around the curve along Forty-second street to the Grand Central Depot, in the direction indicated by the arrow C. The switch adjusted on the west side for this operation was left in position, and the connection between the cross track and that leading down Forty-second street via the west track left intact, instead of being broken,



to allow of the free passage of down trains on the main line. While an up train, as shown in the diagram, was proceeding along the east track in the direction indicated by the arrow A, a down train was passing on the west track in the direction indicated by the arrow B. Instead of following its proper course, which was impossible on account of the misplaced switch at the junction of the cross and west tracks, it went over the route lately followed by the train to the Grand Central Depot, and at the junction of the connecting track with that on the east side came into collision with the up train, as shown in the diagram."

Some of the officers of the company seem disposed to shield themselves from responsibility, on the ground that they cannot be responsible for the neglect or inadvertence of their employés. But surely misplaced switches are not such a new thing that the company, or rather its officers, could not foresee that such "inadvertence" is certain at some time or other to occur. If it is impossible to provide against such carelessness in switching, then nothing more can be said, excepting that the company should select the most careful men procurable, and after that the risk of such negligence would have to be encountered as are other irremediable dangers which attend us all through life. But it is not true that it is impossible to provide against such carelessness. On the contrary, the interlocking system of switches and signals provides an absolute safeguard against mistakes of switchmen, in moving switches so as to be dangerous and at the same time leaving signals to indicate safety or "line clear." With switches and signals properly interlocked it would have been impossible for the switchman to set the switch wrong without placing signals on both tracks to indicate danger. The collision could then not have occurred unless both the locomotive runners had disregarded the signals simultaneously. By the use of distant signals the danger of this would have been lessened about four-fold and by having a switch lock within a reasonable distance of the switch, on the approach of the up train to the lock it would be impossible for the switchman to move the switch until after the train had passed the junction.

The following interview of a Herald reporter with Mr. Cyrus W. Field is given in that paper:

"To what cause do you attribute the accident at Forty-second street?" the reporter asked.

"Solely to the negligence of the switchman," was Mr. Field's reply.

Reporter—And what action will the company take in the matter?

Mr. Field—So far as punishing the guilty party is concerned, action has already been taken. I ordered his immediate dismissal.

Reporter—Will any particular effort be made to prevent a similar accident in the future?

Mr. Field—The only thing necessary is to do away with the switches now in use. There should be no crossing whatever on the road. So long as one remains the traveling public will have to depend upon the reliability of a switchman, and as no man is infallible there will always be more or less danger of collisions. Every passenger should be able to take a train with absolute confidence that he will leave it safe and sound. And that would be the case if it were not for the crossings now in use. Otherwise an elevated road is

the safest in the world. Before long trains will follow each other regularly at an interval of one minute from Harlem to South Ferry and from South Ferry to Harlem; yet if there were no switches to cross there would be really not the slightest danger of collision.

Whether the company will find it practicable to operate their road without switches the public will wait with some interest to see, but in this case the "negligence of the switchman" will not excuse the negligence of those higher in authority who failed to provide the most efficient means, which are well known, to prevent just such accidents from just such causes. If the New York Elevated Railroad Company or its officers knew the danger of operating a double-line junction like that at Forty-second street, with the number of trains which pass it hourly, without an efficient system of interlocking switches and signals, they are culpable for incurring the danger; if they did not know the danger, they are equally culpable for ignorance of what they have had abundant opportunity of learning.

Low Provision Rates.

Provision exports both this season and last have been nearly the same in amount as the Chicago shipments for the same time. Important as these are, they are still small in bulk as compared with the grain trade. The Chicago shipments of pork products for the season from Nov. 1 to March 7 were 254,298 tons this year against 224,060 last, weighing as much as 8,474,606 and 7,468,651 bushels of 60 lbs., respectively, which is not more than it has frequently shipped within three weeks. The shipments of provisions recently are far below the average—for the first week of March only 7,670 tons, while the average for the 17 weeks previous had been 13,700 tons. The bulk of the product has been carried off as it was packed, and hereafter the freight will doubtless be made up chiefly of what is called the "summer packing," which may produce an average of about one-fourth as much weekly as the winter packing. Henceforth grain and flour must, as usual after February, make up the bulk of the east-bound shipments, and, alas! they must be carried at extremely low rates, leaving probably no profit to those roads which have to pro-rate with trunk lines. And there seems no way to remedy this condition of things at this season of the year. For the three months ending with February the railroads by united action could probably have carried just as much freight or very nearly as much, and received one-fifth to one-quarter more for the work; but hereafter until September or near that time the bulk of the traffic—the grain and flour—is beyond their control. They might get a great deal more for provisions, however, than they are now getting or got at any time last year while navigation was open, and though this is not nearly so large as the grain traffic at this season, it is still an important traffic, and if no profit can be made on grain, then it is so much the more important to make a profit on other traffic. The export rates of 37½ to 42½ cents per 100 lbs. from Chicago to Liverpool, reported recently, are fully as low as the ordinary steamer rates from New York, and it is not at all likely that the railroads get more than 15 to 18 cents out of them, at which the less they carry the better off they are. And there is no earthly need of this. Scarcely any hog products would go by lake and almost none by canal were the rates twice or even three times as high, nor would the consumption be affected to any extent. Provisions can afford to pay 40 to 45 cents per 100 lbs. from Chicago to New York even when they are as low as they now are. Even the man who lives on pork alone will not have his expenses reduced a dollar a year by the reduction of a quarter of a cent a pound in the rail freight rate. A very short period of the current rates will serve to clear away the Western stocks, and then many of the railroads will have no considerable east-bound traffic except the summer packing, the live stock and the petroleum on which they can make anything for months to come. Those roads that can squeeze their entire support out of their local traffic may stand this, but there are several that cannot bear this strain many years longer. As things go now the roads which carry the products of the Northwest from its great cities to the seaboard have scarcely any other interest in its growth in population and production than that caused by the growth in the demand for merchandise to be shipped westward. Trains multiply and an enormous force is employed in carrying to the seaboard without adding a dollar to the profits of the business, and for a very large part of the time with any profits whatever. It is desirable that the roads which carry the traffic of a country should be interested in its growth and prosperity, but if things keep on as they are the trunk lines will naturally become completely indifferent to the progress of the most rapidly growing part of the nation, which, while making the largest demands on them for services, contributes nothing toward the interest on the capital invested in the industry by which those services are rendered. It is not as bad as that yet, all the time, but it is a large part of the time. There never can be a large profit on this business, but there ought to be some profit on all of it, and the community as well as the railroad proprietors have an interest in seeing that there should be. The Kansas and Minnesota farmer may chuckle, but the New York and West Virginia people threaten *pro rata* laws.

Record of New Railroad Construction.

This number of the *Railroad Gazette* contains information of the laying of track on new railroads as follows:

Chicago & Alton.—The Kansas City Extension is extended from Independence, Mo., west to Kansas City, 10 miles, completing the road, except the Glasgow Bridge.

Southern Pacific.—Extended eastward 14 miles to a point 25 miles east of Stanwix, Arizona.

Indianapolis, Delphi & Chicago.—Extended from Monticello, Ind., southeast to Delphi, 12¼ miles. It is of 3-ft. gauge.

This is a total of 36¼ miles of new railroad, making 241 miles reported so far in 1879.

THE PROPOSED ATLANTIC & GREAT WESTERN LEASE was the cause of a third meeting of bond and shareholders in London, on the 11th inst., the full proceedings of which are reported in London papers of that week. This was the second and chief McHenry meeting, and scarcely any of those who adhere to the trustees' proposition to lease the road seem to have raised their voices there. The chief speeches were made by Mr. Thomas Cave, who years ago visited this country in behalf of the bondholders, and by James McHenry, in which they certainly said many astonishing things—absurd things as to the value of the road and things equally absurd as to the impossibility of getting a road honestly managed in America. They claim that by raising \$1,500,000 they will be able to pay off the pressing charges and take the road from the hands of the Receiver and work it for themselves if they cannot get a lessee on better terms than the Erie offers. Very likely they can pay off the Receiver's debts in that way, but in a week the Ohio mortgage bondholders would have another receiver if their dues, amounting to \$2,800,000, were not paid. While they are about it, they will do well to provide for this as well as the Receiver's debt. They urge that those who deposited their securities with the trustees under the old scheme now withdraw them, and they propose a committee to carry out their plan, or rather to develop one. But they had been unable to secure all the men whom they wanted to propose for the committee. Several refused, others wanted time to consider and others had not been seen. So the meeting did not appoint a committee, but simply voted to invite ten gentlemen to join it. The names best known in this country are Sir Henry Tyler, James McHenry himself and Mr. Thomas Cave. Mr. McHenry said at the meeting that he would not take a place on the committee, but he probably will; Mr. Cave, it was understood from the first, was to be Chairman.

It is doubtless perfectly practicable for the Atlantic & Great Western Company to work its own road, and if it provides means for clearing away the debts of the Receiver and Ohio bondholders and for making the necessary improvements, they can work it about as well as any lessee. If they did not get fair terms from the Erie they could go to the New York Central, and their connections would be pretty sure to treat it fairly. But unless the bondholders will advance the money themselves, they will be at a great disadvantage. They cannot borrow what is needed on the security of the road, because the road has proved to be a bad security for a very much smaller amount, namely, the Ohio bonds. At least, if they can borrow at all, it will be on very hard terms. The advantage or chief advantage of a lease will be in finding a corporation with credit to raise the money which must be had on better terms than this corporation without credit, the Atlantic & Great Western, can do.

THE LAKE PROPELLER LINES have a marked influence on railroad traffic, as a great deal of traffic that will not on any consideration go by lake and canal will be diverted by a small reduction from the rail rate to go by propeller and railroad. Thus flour and provisions are taken by the propellers in considerable quantities, and they get some merchandise to take west. Each of the trunk railroads except the Baltimore & Ohio has a propeller line running in connection with it. This year the Grand Trunk is apparently making special efforts to get propeller freight. The boats of the Northern Transportation Company, which formerly plied between Chicago and Ogdensburg, are this year to bring their freight to the Grand Trunk at Sarnia, most of them sailing between that place and Chicago, on which route there is to be a boat daily; but three steamers will ply between Cleveland and Sarnia, touching at Toledo, and two on Lake Ontario, between Toronto, Oswego and Cape Vincent. These routes are so much shorter than that between Chicago and Ogdensburg (the time of which is considerably lengthened by the passage of the Welland Canal) that the vessels will probably be able to make twice as many trips and carry twice as much grain, etc. Last year the line running between Chicago and Sarnia consisted of two propellers and five schooners. These will now enter the grain trade between Chicago and Buffalo. Considering what lake rates have been for the past three years and are likely to be hereafter, it seems wise for the trunk lines to cultivate the propeller connections for grain business. They can frequently carry at a profit in competition with the Erie Canal, but hardly ever with the lake vessels.

Two Lake Superior steamboat lines—Leopold & Austrian's and Spencer's—have consolidated under the name of the "Lake Michigan & Lake Superior Transportation Company." It has four steamers, which will make a semi-weekly line between Chicago and Duluth, touching at Lake Superior ports. The Lake Superior Transit Company will run eight or nine steamers, instead of ten as last year, between Buffalo and Lake Superior. Four of them will go through to Duluth; the rest, only as far as Portage Lake. The Lake Superior steamers have a considerable passenger business. The Sarnia boats intend to cultivate such a business the coming season, for which purpose one will leave Chicago in the evening six times a week.

A CHECK TO THE DOWNWARD COURSE OF EAST-BOUND RATES has been attempted. A meeting in Chicago has named 20 cents per 100 lbs. for grain and 25 for fourth class and provisions, below which, it is hoped, no one will go. It

seems to have been too much the disposition to cease all efforts to maintain rates as soon as they have gone very low under circumstances that make it improbable that they can be restored to the figures originally intended. Thus when last January it seemed idle to hope to restore the 35 and 40 cent rates of Nov. 25, the general conclusion seemed to be that the winter business was spoiled any way, and that it was not worth while to spend any more time over rates. But there are different degrees of spoiling. There is as much to be saved by preventing a reduction from 25 to 20 as by avoiding a fall from 35 to 30—and usually more, for more is carried at the low rate. In January it may have been no longer possible to get more than a 25-cent rate, but a very pretty sum might have been saved by carrying at 25 the 4,000,000 and more bushels per week that have been delivered at the Atlantic ports recently, instead of at 20 cents, not to say 15 cents. Whether the rate pays or not is not the question—if it is not so much more clear gain, it is so much less net loss, and that amounts to the same thing. Indeed, the fear of loss ought to have more effect on some of our roads than the hope of gain. That way lies destruction. If nothing can be made out of the spring and summer business, it will be wise to take some pains to make sure that nothing be lost by it, for it will be very, very easy to lose by it. Certainly it is time to call a halt when 20 and 25 cents are the "regular" rates. There is something worse than a small business, and that is a large business done at a loss. The great stocks of grain in store at the lake ports made it appear probable that the vessels would be pretty busy this spring and get a fair price for carrying and leave something for the railroads at paying rates. But if the railroads work down this stock to the ordinary amount by the time navigation opens, then certainly the vessels will carry for next to nothing and leave nothing profitable for the railroads. Nothing could be so favorable for the latter as a profitable season for the lake and canal boats.

THE PENNSYLVANIA RAILROAD EARNINGS ought to reflect pretty fairly the condition of trunk-line business. The amount of these earnings is not reported, but only the increase or decrease—which is aggravating, as it comes so very near to telling us what we want to know without quite doing it. All lines east of Pittsburgh and Erie earned this year \$147,129 more in January, and in February \$375,130 more than in 1878—\$522,259 more in the two months. Now at the average rate per day, the earnings in 1878 would have been \$5,114,000, and the increase is a little more than 10 per cent. on that amount. January and February, however, are not usually average months for earnings, but on most roads below and on many far below the average. The Atlantic & Great Western, for instance, in this period, which is 16 per cent. of the year, in 1877 made but 12½ per cent. of its earnings, and in 1878 but 14½ per cent.; the Lake Shore in 1877 made less than 14 per cent. of its gross earnings in those two months. As the Pennsylvania's earnings also were probably less than the average of the year in those months—that is, less than \$5,114,000—the increase of \$522,000 was probably more than 10 per cent. And the increase is over the business of a year of the (up to that time) largest known winter traffic. It should be said, however, that the Pennsylvania probably has increased its through freight eastward more this year than the average of the trunk lines. It certainly has taken a much larger proportion of the freight out of Chicago. It is also noticeable that the Pennsylvania reports a slight decrease in working expenses for these months. This was hardly to be expected. Supplies and wages are not lower, and with the larger traffic it is doing pretty well to work at the same cost. We doubt if this reduction of expenses will be general. Nowadays an increase of traffic is likely to bring with it some increase in expenses, except where there has been some great improvement in methods or appliances.

THE EAST-BOUND APPORTIONMENT will soon include all the important importing and exporting cities—Boston, Philadelphia and Baltimore as well as New York. A meeting was held on Wednesday of last week at Philadelphia to confer about the matter, and now the materials—statistics of the business of the past two years—are all in the hands of the Commissioner, who will report with recommendations when he has studied them sufficiently. It is only a year or two ago that the Erie and the New York Central established agencies at Philadelphia and Baltimore, but already it is said that the Erie has got quite a large slice of the Philadelphia and the New York Central of the Baltimore business. The latter sends over the Northern Central, and gets but a very short haul on the freight. Boston and Philadelphia shipments are about the same in amount, each about two-sevenths of the New York shipments. Baltimore ships a fourth less than Philadelphia or Boston, but little more than a fifth as much as New York—all three of the places together about a quarter less than New York. Taking the aggregate shipments of the four cities, about 56½ per cent. goes from New York, 15½ from Boston, 15½ from Philadelphia, and 11½ from Baltimore. This, it must be remembered, includes only shipments by the trunk lines to competing points.

MR. JAMES B. HODGSKIN, the President of the United States Rolling Stock Company, sent us a letter last week that was published in our columns on Friday of last week; the same day Mr. Hodgskin died very suddenly and unexpectedly. He is known to railroad men chiefly in connection with the Atlantic & Great Western Railroad Company, and the United States Rolling Stock Company, simply as a business man. It was not so well known that he was a man of rare cultivation, an elegant scholar, and probably unexcelled in

these respects among business men in America. His studies, too, had been largely in the direction of his occupation; that is, he was especially an investigator of financial and economical questions. This tendency he inherited from his father, who was at one time the editor of the *London Economist*, which, as some of our readers may not know, is beyond question the ablest journal in our language in the analysis and discussion of commercial and financial subjects. As a business man, Mr. Hodgskin was a painstaking organizer, and especially careful and conservative in his financial arrangements. He will be best remembered by many, doubtless, by his persistency in insisting upon what he considered to be the rights of his companies. He has had several important lawsuits, which have been contested by him most determinedly; and generally he pursued his purposes with remarkable persistence and energy. He held peculiar opinions, we believe, on some economical questions, but very few were so well informed, and it is unfortunate that we do not have among our administrators of corporation affairs more men of his peculiar training and mental cultivation.

A LAKE VESSEL COMBINATION has been undertaken at a convention of vessel-owners at Cleveland. It is proposed to have a board of seven for each port to fix rates weekly which every member of the Association will be bound to maintain. There can be no doubt that it would be well for the railroads between St. Louis and Chicago and the East if lake rates could be kept from going so low as they have been for two or three years past; but it is hardly possible that such a combination should succeed. Lake transportation is radically different from railroad transportation. The number of competitors is indefinitely large, and a new one can appear at short notice. The road is of infinite capacity, costs nothing for maintenance and nothing for interest on the investment. If one route does not pay it can be at any moment abandoned for another one, and if one competitor can do the work much cheaper than another, the latter will be driven from the field, which is not the case with railroads. Anyone who buys or builds a vessel may destroy the combination, or at least spoil its rates, and with a strong combination and pretty high rates, and a great surplus of tonnage, the outside vessels would be likely to get much more than their share of the freight. While the Association was charging 3 cents a bushel, firm, from Chicago to Buffalo, the outside vessels would accept 2½¢, and until they were full the others would get nothing.

FEBRUARY EARNINGS are reported in our table for 30 rail roads, with 17,523 miles of road, which is 21 per cent. of the total in operation in the United States at this time. These roads, with 3.9 per cent. greater mileage, earned 1.9 per cent. more money, the average earnings per mile of road having fallen from \$417 to \$409, or about 2 per cent. Twelve of the 30 roads show decreases. All the large decreases but one are on the "spring-wheat roads" of the Northwest. The other one is on the Toledo, Peoria & Warsaw. The most notable increases are on the two Kansas roads—80 and 36½ per cent.; but the roads leading to Kansas do not seem to have profited greatly by the rush thither, the Chicago & Alton gaining but 4 per cent. and the Hannibal & St. Joseph 6.7 per cent. Another notable gain is 31.3 per cent. on the Philadelphia & Erie.

For the two months ending with February the reports show a decrease of 5.7 per cent in the average earnings per mile of the 31 roads in the list.

General Specifications for Iron Bridges.

The New York, Lake Erie & Western Railroad has issued the following general specifications for iron bridges that may be built on that road:

GENERAL DESCRIPTION.

1. All parts of the superstructure shall be of wrought iron, except bed-plates and washers, which may be of cast iron.
2. *Kinds of Bridges.*—The following modes of construction shall preferably be employed:
Spans, up to 17 feet Rolled beams.
" 17 to 40 " Riveted plate girders.
" 40 to 75 " Riveted lattice girders.
" over 75 " Pin-connected trusses.
3. In calculating strains, the length of span shall be understood to be the distance between centres of end pins for trusses, and between centres of bearing plates for all beams and girders.
4. *Spacing of girders.*—The girders shall be spaced (with reference to the axis of the bridge), as required by local circumstances, and directed by the Chief Engineer of the railroad company.*
5. *Head-room.*—In all through bridges there shall be a clear head-room of 20 ft. above the base of the rails.
6. *Floor.*—The wooden floor will consist of transverse floor timbers, extending the full width of the bridge, supporting the rails and guard beams. Their scantling will vary with circumstances. They will be furnished and put on by the railroad company.
7. *Loads.*—Bridges shall be proportioned to carry the following loads:

* Generally, in through bridges, the clear width between trusses shall be 15 ft. for single track, and 28 ft. for double track. In deck bridges, and for the floor system of all bridges, the spacing between the centres of trusses and girders shall generally be as follows:

DESCRIPTION.	Single track.	DOUBLE TRACK.	
		2 trusses.	3 trusses.
Deck truss bridges.....	12 ft. or over.	16 ft. or over.	10 ft. or over.
Deck plate girders.....	8 " "	16 " "	10 " "
Floor stringers.....	8 " "	10 " "	8 " "

The centres of beams and plate girders shall be not less than four feet (on either side) from the centre of the broad-gauge track.
The standard distance between centres of tracks is 13 ft.

- 1st. The weight of iron in the structure.
- 2d. A floor weighing 400 lbs. per lineal foot of track, to consist of the rails, ties and guard timbers only.
- These two items, taken together, shall constitute the "dead load."
- 3d. A moving load for each track, supposed to be moving in either direction, and consisting of two "consolidation"



engines coupled, followed by a train weighing 2,240 lbs. per running foot. This "live load" being concentrated upon distributed as in the following diagram:

Stresses.—The maximum strains due to all positions of the above "live" load and of the "dead load," shall be taken to proportion all the parts of structure.

7. *Lateral Stresses.*—To provide for wind strains and vibrations, the top lateral bracing in deck bridges, and the bottom lateral bracing in through bridges shall be proportioned to resist a lateral force of 450 lbs. for each foot of the span; 300 lbs. of this to be treated as a moving load.

The bottom lateral braces in deck bridges, and the top lateral bracing in through bridges, shall be proportioned to resist a lateral force of 150 lbs. for each foot of the span.

8. *Temperature.*—Variations in temperature, to the extent of 150 degrees, shall be provided for.

9. All parts shall be so designed that the strains coming upon them can be accurately calculated.

10. *Plans and Strain Sheets.*—Strain sheets and a general plan, showing the dimensions of the parts and general details, must accompany each proposal.

11. Upon the acceptance of a proposal, a full set of working drawings must be submitted for approval by the Chief Engineers of the Railroad company, before the work is commenced.

12. *Form of Truss.*—Unless otherwise specified, the form of truss may be selected by the builder; but, to secure uniformity in appearance, it is desired that all "through" trusses shall be built with inclined end-posts.

13. In comparing competitive plans, the relative cost of the wooden floors required will be taken into consideration.

14. The following clauses are all intended to apply to iron construction. Parties proposing to substitute steel for particular parts will be required to furnish evidence of its strength, elasticity, uniformity in production, and adaptability to the intended purpose.

PROPORTION OF PARTS.

1. *Tensile Strains.*—All parts of the structures shall be so proportioned that the maximum strains produced shall in no case cause a greater tension than the following:

	Pounds per square in.
On lateral bracing.....	15,000
On solid rolled beams, used as cross floor-beams and stringers.....	10,000
On bottom chords and main diagonals.....	10,000
On corner rods and long verticals.....	8,000
On bottom flange of riveted cross-girders, net section.....	8,000
On bottom flange of riveted longitudinal plate girders over 20 ft. long, net section.....	8,000
On bottom flange of riveted longitudinal plate girders under 20 ft. long, net section.....	7,000
On floor-beam hangers, and other similar members liable to sudden loading.....	6,000

2. *Compressive Strains.*—Compression members shall be so proportioned that the maximum load shall in no case cause a greater strain than that determined by the following formulae:

$$P = 1 + \frac{L^2}{40,000 R^2} \text{ for square end compression members.}$$

$$P = 1 + \frac{L^2}{30,000 R^2} \text{ for compression members with one pin and one square end.}$$

$$P = 1 + \frac{L^2}{20,000 R^2} \text{ for compression members with pin bearings.}$$

P = the allowed compression per square inch of cross section.
L = the length of compression member, in inches.
R = the least radius of gyration of the section, in inches.

3. The lateral struts shall be proportioned by the above formulae, to resist the resultant due to an assumed initial strain of 10,000 lbs. per square inch upon all the rods attaching to them, produced by adjusting the bridge.

4. In beams and girders, compression shall be limited, as follows:

	Pounds per square in.
In rolled beams, used as cross floor beams and stringers.....	10,000
In riveted plate girders, used as cross floor-beams, gross section.....	6,000
In riveted longitudinal plate girders over 20 ft. long, gross section.....	6,000
In riveted longitudinal plate girders under 20 ft. long, gross section.....	5,000

5. Members subjected to alternate strains of tension and compression shall be proportioned to resist each of them. The strains, however, shall be assumed to be increased by an amount equal to eight-tenths of the least strain.

6. *Shearing Strains.*—The rivets and bolts connecting all parts of the girders must be so spaced that the shearing strain per square inch shall not exceed 6,000 lbs., nor the pressure upon the bearing surface exceed 12,000 lbs. per square inch of the projected semi-intrados (diameter × thickness of piece) of the rivet or bolt-hole.

7. *Bending Strains.*—Pins shall be so proportioned that the shearing strain shall not exceed 7,500 lbs. per square inch; nor the crushing strain upon the projected area of the semi-intrados (diameter × thickness of piece) of any member connected to the pin, be greater than 12,000 lbs. per square inch; nor the bending strain exceed 15,000 lbs. per square inch; when the centres of bearings of the strained members are taken as the points of application of the strains.

8. In case any member is subjected to a bending strain from local loadings (such as distributed floors on deck bridges), in addition to the strain produced by its position as a member of the structure, it must be proportioned to resist the combined strains.

9. *Plate Girders.*—Plate girders shall be proportioned upon the supposition that the bending or chord strains are resisted entirely by the upper and lower flanges, and that the shearing or web strains are resisted entirely by the web-plate.

10. The compression flanges of beams and girders shall be stayed against transverse crippling, when their length is more than thirty times their width.

11. The unsupported width of any plate subjected to compression, shall never exceed thirty times its thickness.

12. In members subject to tensile strains, full allowance shall be made for reduction of section by rivet-holes, screw-threads, etc.

13. The iron in the web-plates shall not have a shearing strain greater than 4,000 lbs. per square inch, and no web-



plate shall be less than one-quarter inch in thickness.

14. No wrought iron shall be used less than 5-16 inch thick, except in places where both sides are always accessible for cleaning and painting.

DETAILS OF CONSTRUCTION.

1. All the connections and details of the several parts of the structure shall be of such strength, that, upon testing, rupture shall occur in the body of the members rather than in any of their details or connections.

2. Preference will be had for such details as will be most accessible for inspection, cleaning and painting.

3. The web of plate girders must be spliced at all joints by a plate on each side of the web. T-iron must not be used for splices.

4. When the least thickness of the web is less than 1-80th of the depth of a girder, the web shall be stiffened at intervals not over twice the depth of the girder.

5. The pitch of rivets in all classes of work shall never exceed 6 in., nor sixteen times the thinnest outside plate, nor be less than three diameters of the rivet.

6. The rivets used will generally be ¾ and ½ in. diameter.

7. The distance between the edge of any piece, and the centre of a rivet-hole must never be less than 1½ in. except for bars less than 2½ in. wide; when practicable it shall be at least two diameters of rivets.

8. When plates more than 12 in. wide are used in the flanges of plate or lattice girders, an extra line of rivets, with a pitch of not over 9 in. shall be driven along each edge to draw the plates together and prevent the entrance of water.

9. In punching plate or other iron, the diameter of the die shall in no case exceed the diameter of the punch by more than ⅛ of an inch.

10. All rivet-holes must be so accurately punched that when the several parts forming one member are assembled together, a rivet ⅛ inch less in diameter than the hole can be entered, hot, into any hole, without reaming or straining the iron by "drifts."

11. The rivets when driven must completely fill the holes.

12. The rivet-heads must be hemispherical, and of a uniform size for the same sized rivets throughout the work. They must be full and neatly made, and be concentric to the rivet-hole.

13. Whenever possible, all rivets must be machine-driven.

14. The several pieces forming one built member must fit closely together, and when riveted shall be free from twists, bends or open joints.

15. All joints in riveted work, whether in tension or compression members, must be fully spliced, as no reliance will be placed upon abutting joints. The ends, however, must be dressed straight and true, so that there shall be no open joints.

16. *Lower Chords and Suspension Bars.*—The heads of eye-bars shall be so proportioned that the bar will break in the body instead of in the eye. The form of the head and the mode of manufacture shall be subject to the approval of the Chief Engineer of the railroad company.

17. The bars must be free from flaws, and of full thickness in the necks. They shall be perfectly straight before boring. The holes shall be in the centre of the head, and on the centre-line of the bar.

18. The bars must be bored of exact lengths, and the pin-hole ⅛ inch larger than the diameter of the pin.

19. The lower chord shall be packed as narrow as possible.

20. *Pins.*—The pins shall be turned straight and smooth, and shall fit the pin-holes within ⅛ of an inch.

21. The diameter of the pin shall not be less than two-thirds the largest dimensions of any tension member attached to it. Its effective length shall not be greater than the breadth of the foot of the post, plus four times the diameter of the pin. The several members attaching to the pin shall be packed close together, and all vacant spaces between the chords and posts must be filled with wrought-iron filling rings.

22. *Upset Screw Ends.*—All rods and hangers with screw ends shall be upset at the ends, so that the diameter at the bottom of the threads shall be ⅛ inch larger than any part of the body of the bar.

23. All threads must be of the United States standard, except at the ends of the pins.

24. *Floor-Beam Hangers.*—Floor-beam hangers shall be so placed that they can be readily examined at all times. When fitted with screw ends they shall be provided with check nuts.

25. When bent loops are used, they must fit perfectly around the pin throughout its semi-circumference.

26. *Compression Members.*—Compression members shall be of wrought iron of approved forms.

27. The pitch of rivets for a length of two diameters at the ends shall not be over four times the diameter of the rivets.

28. The open sides of all trough-shaped sections shall be stayed by diagonal lattice-work at distances not exceeding the width of the member. The size of bars shall be fully proportioned to the width.

29. All pin-holes shall be reinforced by additional material, so as not to exceed the allowed pressure on the pins. These reinforcing plates must contain enough rivets to transfer the proportion of pressure which comes upon them.

30. Pin-holes shall be bored exactly perpendicular to a vertical plane passing through the centre line of each member, when placed in a position similar to that it is to occupy in the finished structure.

31. *Abutting Joints.*—The ends of all square-ended members shall be planed smooth, and exactly square to the centre line of strain.

32. All members must be free from twists or bends. Portions exposed to view shall be neatly finished.

33. *Splicing of Top Chord.*—The sections of the top chord shall be connected at the abutting ends by splices, sufficient to hold them truly in position.

34. *Lateral Bracing.*—In no case shall any lateral or diagonal rod have a less section than ¾ of a square inch.

35. The attachment of the lateral system to the chords shall be thoroughly efficient. If connected to suspended floor beams, the latter shall be stayed against all motion.

36. *Transverse Diagonal Bracing.*—All through bridges with top lateral bracing shall have wrought-iron portals, of

approved design, at each end of the span, connected rigidly to the end posts.

37. When the height of the trusses exceeds 25 feet, overhead diagonal bracing shall be attached to each post, and to the top lateral struts.

38. Pony-trusses and through plate or lattice girders shall be stayed by knee-braces or gusset-plates attached to the top chords, at the ends, and at intermediate points not more than 10 ft. apart, and attached below to the cross floor beams or to the transverse struts.

In all deck bridges diagonal bracing shall be provided at each panel. In double-track bridges this bracing shall be proportioned to resist the unequal loading of the trusses. The diagonal bracing at the ends shall be of the same equivalent strength as the end top lateral bracing.

39. Bed-Plates.—All bed-plates must be of such dimensions that the greatest pressure upon the masonry shall not exceed 250 lbs. per square inch.

40. Friction Rollers.—All bridges over 50 ft. span shall have at one end nests of turned friction rollers, formed of wrought iron, running between planed surfaces. The rollers shall not be less than 2 in. diameter, and shall be so proportioned that the pressure per lineal inch of rollers, shall not exceed the product of the square root of the diameter of the roller in inches multiplied by 500 lbs. (500 \sqrt{d}).

41.—Bridges less than 50 ft. span will be secured at one end to the masonry, and the other end shall be free to move by sliding upon planed surfaces.

42. Camber.—All bridges will be given a camber, by making the panel lengths of the top chord longer than those of the bottom chord in the proportion of $\frac{1}{8}$ of an inch to every ten feet.

QUALITY OF IRON.

1. All wrought-iron must be tough, fibrous and uniform in character. It shall have a limit of elasticity of not less than 26,000 lbs. per square inch.

Finished bars must be thoroughly welded during the rolling, and free from injurious seams, blisters, buckles, cinder spots or imperfect edges.

2. For all tension members the muck bars shall be rolled into flats, and again cut, piled and rolled into finished sizes. They shall stand the following tests:

3. Tension Tests.—Full sized pieces of flat, round or square iron, not over $\frac{1}{4}$ in. in sectional area, shall have an ultimate strength of 50,000 lbs. per square inch, and stretch 12 $\frac{1}{2}$ per cent. in their whole length.

Bars of a larger sectional area than $\frac{1}{4}$ square inches, when tested in the usual way, will be allowed a reduction of 1,000 lbs. per square inch, for each additional square inch of section, down to a minimum of 46,000 lbs. per square inch.

4. When tested in specimens, of uniform sectional area of at least $\frac{1}{8}$ square inch for a distance of 10 inches, taken from tension members which have been rolled to a section not more than $\frac{1}{4}$ square inches, the iron shall show an ultimate strength of 52,000 lbs. per square inch, and stretch 18 per cent. in a distance of 8 in.

Specimens taken from bars of a larger cross section than $\frac{1}{4}$ in. will be allowed a reduction of 500 lbs. for each additional square inch of section, down to a minimum of 50,000 lbs.

5. The same sized specimen taken from angle and other shaped iron, shall have an ultimate strength of 50,000 lbs. per square inch, and elongate 15 per cent. in 8 in.

6. The same sized specimen taken from plate-iron shall have an ultimate strength of 48,000 lbs., and elongate 15 per cent. in 8 in.

7. Bending Tests.—All iron for tension members must bend cold, for about 90 degrees, to a curve whose diameter is not over twice the thickness of the piece, without cracking. At least one sample in three must bend 180 degrees to this curve without cracking. When nicked on one side, and bent by a blow from a sledge, the fracture must be nearly all fibrous, showing but a few crystalline specks.

8.—Specimens from angle, plate and shaped iron must stand bending cold through 90 degrees and to a curve whose diameter is not over three times its thickness, without cracking.

When nicked and bent, its fracture must be mostly fibrous.

9. Rivets and pins shall be made from the best double-refined iron.

10. Cast Iron.—The cast iron must be of the best quality of soft gray iron.

11. Tests.—All facilities for inspection of iron and workmanship shall be furnished by the contractor. He shall furnish without charge such specimens (prepared) of the several kinds of iron to be used as may be required to determine their character.

12. Full sized parts of the structure may be tested at the option of the Chief Engineer of the railroad company, but if tested to destruction, such material shall be paid for at cost, less its scrap value, to the contractor, if it proves satisfactory. If it does not stand the specified tests, it will be considered rejected material, and be solely at the cost of the contractor.

WORKMANSHIP.

1. All workmanship shall be first-class in every particular.

2. Abutting joints in truss bridges shall be in exact contact throughout.

3. Bars which are to be placed side by side in the structure shall be bored at the same temperature, and of such equal length that upon being piled on each other, the pins shall pass through the holes at both ends without driving.

4. Whenever necessary, for the protection of the thread, provision shall be made for the use of pilot nuts, in erection.

PAINTING.

1. All work shall be painted at the shop with one good coat of selected iron ore paint and pure linseed oil.

2. In riveted work, all surfaces coming in contact shall be painted before being riveted together.

Bed-plates, the inside of closed sections, and all parts of the work which will not be accessible for painting after erection shall have two coats of paint.

3. Pins, bored pin-holes, and turned friction rollers shall be coated with white lead and tallow before being shipped from the shop.

4. After the structure is erected, the iron-work shall be thoroughly and evenly painted with two additional coats of paint, mixed with pure linseed oil, of such color as may be directed, the tension members being, however, generally of lighter color than the compression members.

ERECTION.

1. The railroad company will take down the old bridge, if any exists. It will furnish the lower false works, or supporting trestles only. The use of these false works by the contractor shall be construed as his approval of them.

2. The contractor shall furnish all other staging (the plan and construction of which must be approved by the Chief Engineer), and shall erect and adjust all the iron work complete.

3. The contractor shall so conduct all his operations, as not to impede the running of the trains or the operations of the road.

4. The contractor shall assume all risks of accidents to

men or material, during the manufacture and erection of the bridge.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings will be held as follows:
Panama, annual meeting, at the company's office in New York, April 7, at noon.

Chicago & Alton, annual meeting, at the company's office in Chicago, April 7, at 10 a. m.

Railroad Conventions.

The General Time Convention will meet at the Galt House, Louisville, April 9.

The Southern Time Convention will meet at the Continental Hotel, Philadelphia, April 16.

The Car Accountants' Association will hold its annual convention at the Grand Pacific Hotel, Chicago, April 23.

Dividends.

Dividends have been declared as follows:
Chicago, Rock Island & Pacific, 2 per cent., quarterly, payable May 1. Also 2 per cent., quarterly, on Iowa Southern & Missouri Northern stock held in trust, which will bring the dividend paid to Rock Island stockholders up to $2\frac{1}{2}$ per cent.

Chicago, Milwaukee & St. Paul, $3\frac{1}{2}$ per cent., semi-annual, on the preferred stock, payable April 15.

Mail Service Extensions.

Mail service has been ordered over railroad lines as follows:

Pennsylvania & Delaware, service ordered from Landenberg, Pa., to Pomeroy, 19.32 miles.

Willamette Valley, service ordered from Dayton, Oregon, to Sheridan, 26.18 miles.

Pittsburgh Southern, service extended from Finleyville, Pa., to Thomas, 5.50 miles.

Western Transportation Association.

A meeting of this new Association was held in St. Louis, March 20. It was stated that the Eastern roads would not join in the agreement to limit the issue of passes, and it was then decided to exclude from the arrangement all the territory east of the eastern lines of Illinois and Indiana.

The Executive Committee of seven was reduced to five by dropping from it Mr. Newell, of the Lake Shore; McCullough, of the Pennsylvania, and Thomas, of the Cleveland, Columbus, Cincinnati & Indianapolis, and substituting Mr. Kimball, of the Chicago & Northwestern.

Southwestern Railroad Association.

At the regular monthly meeting in St. Louis, March 20, there was a long discussion on the re-arrangement of the division of traffic. No conclusion was reached, and the matter was finally put over until the April meeting in Chicago. The point at issue is the position occupied by the Chicago & Alton's new line to Kansas City.

International Roadmasters' Association.

At the adjourned meeting of roadmasters held, pursuant to call, in Boston, March 25, it was resolved to form a permanent association for the purpose of mutual assistance and improvement in their work. The association is named the "International Roadmasters' Association." Officers were chosen and the work of perfecting the constitution and by-laws was intrusted to a committee, which is to report at an adjourned meeting, to be held at Niagara Falls on the second Wednesday in September next.

ELECTIONS AND APPOINTMENTS.

American Society of Civil Engineers.—At the meeting on Feb. 5 William H. Bradley, of Boston, and Hamilton Smith, Jr., of San Francisco, were elected members.

Atchison & Nebraska.—The following circular is dated March 20:

"On and after this date, the office of the Assistant Treasurer will be discontinued. Mr. J. S. Ford is appointed Auditor of all the accounts of the Operating Department, with office at Kansas City, and all orders issued by him relative thereto will be respected. Mr. J. H. Aldrich is appointed Cashier, with office at Kansas City. He will have charge of receipts and disbursements, and after this date all drafts for balances due from this to other roads for car-mileage, ticket or other accounts may be drawn on him. Mr. A. R. Storer is appointed Paymaster, with office at Kansas City."

Chicago, Burlington & Quincy.—Mr. Wm. Irving is appointed Purchasing Agent, in place of Mr. C. M. Higginson, who has accepted a position which requires him to act as a general adviser or counsel to the officers of the company. Mr. Irving was recently Superintendent of the Burlington & Missouri River in Nebraska.

Cleveland, Tuscarawas Valley & Wheeling.—At the annual meeting in Cleveland, March 12, the following directors were chosen: Selah Chamberlain, Hubbard Cooke, Jas. Mason, Amasa Stone, W. S. Streater, Cleveland, O.; S. P. Rhodes, W. W. Holloway, Bridgeport, O.; Clement Russell, Massillon, O.; Henry A. Kent, New York. The board re-elected Selah Chamberlain President; W. S. Streater, Vice-President; Oscar Townsend, General Manager; P. A. Hewitt, Secretary, Treasurer and Auditor; W. H. Grout, General Freight and Ticket Agent.

Concord & Claremont.—Mr. Edgar H. Woodman, of Concord, N. H., has been chosen Treasurer.

Eastern.—The following circulars have been issued:
"Mr. H. N. Rowell, having resigned the office of Superintendent of Telegraph, Mr. W. H. Vaughan is hereby appointed to the position, with office at Boston, to take effect April 1, 1879. In addition to his duties as above, Mr. Vaughan will act as Assistant Train Dispatcher, with authority to move trains and engines over his own signature, as follows: On the Main Line (between Boston and Portland), on the Conway Division, on the Saugus Branch, on the East Boston Branch and on the Salisbury Branch. He will be obeyed and respected accordingly."

"Mr. Henry Scannell is hereby appointed Assistant Train Dispatcher, to take effect April 1, 1879, with authority to move trains and engines over his own signature, as follows: On the Main Line (between Boston and Portland), on the Conway Division, on the Saugus Branch, on the East Boston Branch and on the Salisbury Branch. He will be obeyed and respected accordingly."

Grayville & Mattoon.—At the annual meeting in Olney, Ill., March 19, the following directors were chosen: L. W. Lowe, Edwards County, Ill.; E. S. Wilcox, R. W. Babbitt, Richland County, Ill.; J. J. Rider, Thomas Cooper, Samuel Barker, Jasper County, Ill.; R. J. Lawrence, Coles County, Ill.; R. Bloomfield, Cumberland County, Ill.; W. T. Wallace, Pittsburgh, Pa. The board elected E. S. Wilson, Presi-

dent; J. J. Rider, Vice-President; Leonidas Chapin, Secretary; R. W. Babbitt, Treasurer; C. S. Fetterman, Attorney.

Indianapolis, Bloomington & Western, Western Extension.—Receiver Smith announces the following appointments for this line, now worked separately: A. H. Wood, General Superintendent; M. A. McDonald, Auditor; Jay G. Rupert, General Freight and Ticket Agent. Offices at Urbana, Ill.

Intercolonial.—The following new appointments and transfers are announced: P. S. Archibald, Resident Engineer, Moncton, N. B.; T. V. Cook, Assistant Auditor of Traffic, Moncton, N. B.; H. N. Williston, Storekeeper at Halifax, N. S.

Mechanical Foremen: Wm. Johnson, Richmond, N. S.; J. Perley, Newcastle, N. B.; Joseph Moore, Campbellton, N. B.; Pierre Ouellette, Ste. Flavie, P. Q.

Trackmasters: Halifax to Amherst and Pictou Branch, J. M. Ross; Wm. Yould, Assistant; Amherst to St. John and Shediac Branch, John S. Trites; G. Lockhart, Assistant; Moncton to Campbellton, W. W. McLellan; John Patterson, Assistant; Campbellton to Riviere du Loup, James Yeo; T. Leveque, Assistant.

International Roadmasters' Association.—This Association was organized in Boston March 25, and the following officers chosen: President, L. J. Spaulding, Fitchburg Railroad; Vice-Presidents, J. W. Kennedy, Jeffersonville, Madison & Indianapolis, and J. W. Alsop, Atlantic & Great Western; Secretary, George T. Wiswell, Troy & Greenfield; Treasurer, G. R. Hardy, Boston & Albany.

Kansas Pacific.—General Superintendent Oakes having resigned, Receiver S. T. Smith assumes the duties of that office for the present, and will make no appointment until the relations of the road with the Union Pacific management are definitely settled.

Kingston & Pembroke.—At the annual meeting in Kingston, Ont., recently, the following directors were chosen: J. Carruthers, C. F. Gildersleeve, A. Gunn, W. Hart, G. A. Kirkpatrick, W. Nickle, R. P. Flower, J. Swift, I. Upper. The board elected C. F. Gildersleeve President; A. Gunn, Vice-President.

Leavenworth, Council Grove & Sterling.—The first board of directors is as follows: Ansel R. Clark, C. T. Daniels, J. H. Smith, C. D. Ulmer, Sterling, Kan.; William West, McPherson City, Kan.; H. W. Gildemeister, H. E. Richter, Council Grove, Kan.; F. A. Diffenderfer, Lancaster, Pa.

Oxford & Henderson.—This company has been organized by the election of the following officers: President, Dr. H. C. Herndon; Secretary, H. A. Williams; Treasurer, R. W. Harris. The office is at Oxford, Granville County, N. C.

Pennsylvania.—At the annual election in Philadelphia, March 25, the old board was re-elected, as follows: Thomas A. Scott, Josiah Bacon, Wistar Morris, John M. Kennedy, Samuel M. Felton, Alexander Biddle, N. Parker Shortridge, Henry M. Phillips, D. B. Cummins, Henry D. Welsh. An opposition ticket was nominated, but did not receive many votes.

The board has re-elected Thomas A. Scott, President; Geo. B. Roberts, First Vice-President; Edmund Smith, Second Vice-President; A. J. Cassatt, Third Vice-President; Joseph Leslie, Secretary; Bayard Butler, Treasurer.

Quincy, Missouri & Pacific.—The new board has re-elected Henry Root, President; Amos Green, Vice-President and General Manager; Joseph G. Rowland, Secretary; Charles H. Bull, Treasurer; Frank D. Schermerhorn, General Superintendent.

Rochester & Genesee Valley.—The first board of directors of this new company is as follows: C. V. B. Barse, Olean, N. Y.; John N. Davidson, Genesee Falls, N. Y.; Michael Dowling, Mt. Morris, N. Y.; Archibald Kennedy, York, N. Y.; F. D. Lake, Nunda, N. Y.; E. J. Farnum, Wellsville, N. Y.; M. L. Ross, Hume, N. Y.; W. P. Stevens, Cuba, N. Y.; C. S. Whitney, Belmont, N. Y.; S. J. Arrol, George C. Buell, L. P. Ross, R. A. Sibley, Rochester, N. Y.

Senate Committees.—The following are the committees of the United States Senate on matters connected with railroads:

Patents.—Senators Kernan, of New York, Chairman; Coke, of Texas; Slater, of Oregon; Call, of Florida; Booth, of California; Hoar, of Massachusetts; Platt, of Connecticut.

Post-Offices and Post-Roads.—Senators Maxey, of Texas, Chairman; Salisbury, of Delaware; Bailey, of Tennessee; Houston, of Alabama; Farley, of California; Groome, of Maryland; Ferry, of Michigan; Hamlin, of Maine; Kirkwood, of Iowa.

Railroads.—Senators Ransom, of North Carolina, Chairman; Lamar, of Mississippi; Eaton, of Connecticut; Grover, of Oregon; Williams, of Kentucky; Pendleton, of Ohio; Jones, of Florida; Dawes, of Massachusetts; Saunders, of Nebraska; Teller, of Colorado; Windom, of Minnesota.

Improvement of the Mississippi River and Tributaries.—Senators Lamar, of Mississippi, Chairman; Cockrell, of Missouri; Harris, of Tennessee; Jonas, of Louisiana; Blaine, of Maine; Kellogg, of Louisiana.

Transportation Routes to the Sea-Board.—Senators Beck, of Kentucky, Chairman; Johnston, of Virginia; Voorhees, of Indiana; Hampton, of South Carolina; Cameron, of Wisconsin; Cameron, of Pennsylvania; Windom, of Minnesota.

Toledo & Morenci.—The officers of this new company are: James M. Ashley, President; A. E. Macomber, Secretary and Treasurer. Offices at Toledo, O.

Woodruff Sleeping & Parlor Coach Co.—At the annual meeting March 18 the following directors were chosen: Frank Rahm, James Irwin, C. W. Doubleday, J. M. McClintock, E. Poulson, Alexander Reynolds, W. G. Johnston. The board elected Frank Rahm President; James Irwin, Vice-President; Augustus Trump, Secretary and Treasurer.

PERSONAL.

—Mr. T. F. Oakes has resigned his position as General Superintendent of the Kansas Pacific road. The resignation will take effect March 31.

—J. W. Hunt, President, and J. T. Clark, Superintendent of the Toledo, Delphos & Indianapolis roads, were both badly injured near Delphos, O., March 20, a hand-car in which they were riding having struck a tie laid on the track, upsetting the car and throwing its occupants down a bank.

—Hon. Josiah Minot, of Concord, N. H., has declined the presidency of the Northern (New Hampshire) Railroad Company to which he was lately elected.

—Mr. W. H. Buckingham, for a number of years past Secretary and Auditor of the Terre Haute & Indianapolis Company, died at his residence in Terre Haute, Ind., March 23.

—Mr. A. K. Warren, the chief builder and long a director of the Buffalo, Corry & Pittsburgh road, has removed from Mayville, N. Y., to Colorado, to engage in mining business.

—Mr. Robert Parks, Secretary of the Kansas City, St.

Louis & Chicago Company, and for many years connected with the Chicago & Alton, died suddenly of apoplexy in St. Louis, March 18. He was 68 years old.

—Mr. James Black Hodgskin, President of the United States Rolling Stock Company, died at his residence in Brooklyn, N. Y., March 20, after a short and apparently not dangerous illness. He was born in London in 1831, and first came to this country in 1856 as agent for the great fur house of Oppenheim & Co. Afterward he was agent for Faber & Co., the pencil makers, and then went into the banking-house of Randall, Hodgskin & Hopkins, in New York. He became largely interested in the Erie and Atlantic & Great Western roads, and was made Secretary and Treasurer of the United States Rolling Stock Company on its first organization, and President soon after. He has also been President of the Lake Erie & Louisville Railroad Company since its reorganization.

TRAFFIC AND EARNINGS.

Railroad Earnings.

Earnings for various periods are reported as follows:					
Year ending Dec. 31:	1878.	1877.	Inc. or Dec.	P. c.	
Cleve. & Pittsburgh.....	\$2,474,634	\$2,392,326	I.	\$82,308	3.4
Net earnings.....	1,168,580	1,100,664	I.	67,916	6.2
Month of December:					
Col., Chi. & Indiana.....	\$307,573	.....	.....	.....	.....
Central.....	35,782	.....	.....	.....	.....
N. Y., Lake Erie & Western.....	1,205,755	\$1,465,133	D.	\$259,378	17.8
Net earnings.....	305,726	461,259	D.	155,533	33.7
Two months ending Feb. 28:					
1878.	1877.				
Houston & Texas Central.....	\$502,061	\$445,085	I.	\$56,976	12.8
Net earnings.....	195,358	135,520	I.	59,838	44.2
Philadelphia & Erie.....	449,747	401,003	I.	48,744	12.2
Net earnings.....	168,694	130,117	I.	38,577	29.7
St. Louis & S. E.....	171,711	168,692	I.	3,019	1.8
Net earnings.....	37,575	28,201	I.	9,374	32.8
Month of January:					
Chicago, Burlington & Quincy.....	\$1,105,097	\$1,045,408	I.	\$59,689	5.7
Net earnings.....	515,985	479,686	I.	36,299	7.6
Dakota Southern.....	19,705	16,430	I.	3,275	20.0
Second week in March:					
Chi. & Eastern Illinois.....	\$14,990	\$13,574	I.	\$1,416	10.5
St. Louis, Iron Mt. & Southern.....	86,500	94,848	D.	8,348	8.8
Week ending March 7:					
Great Western.....	\$86,617	\$77,192	I.	\$9,425	12.2
Week ending March 14:					
Great Western.....	\$85,357	\$83,702	I.	\$1,655	2.0
Week ending March 15:					
Grand Trunk.....	\$179,752	\$174,785	I.	\$4,967	2.8

Petroleum.

Stowell's Petroleum Reporter gives the production of the Pennsylvania oil wells for February as follows, in barrels:

	1879.	1878.	Inc. or Dec.	P. c.
Production.....	1,197,420	1,093,856	I.	103,564 9.5
Shipments out of the region.....	702,729	774,234	D.	71,505 9.2
Stock on hand Feb. 28.....	5,792,063	3,875,964	I.	1,916,099 49.5
No. of producing wells.....	10,582	8,725	I.	1,857 21.3

Pittsburgh receipts of crude oil for the month were 65,622; shipments were 56,174 barrels; refined oil, equivalent to 84,261 barrels of crude oil. Stock of crude at Pittsburgh Feb. 28, was 330,341 barrels.

Cotton.

Receipts at shipping markets for the week ending March 21 and for the crop year ending that day, in bales, are reported as follows by the Commercial and Financial Chronicle:

	1879.	1878.	1877.	1876.	1875.
Week.....	60,302	75,723	32,369	62,933	50,186
Crop year.....	4,058,522	3,827,988	3,700,632	3,607,764	3,157,200

The exports for the same periods were:

	1879.	1878.	Inc. or Dec.	P. c.
Week.....	89,678	124,467	D.	34,789 38.0
Crop year.....	2,828,716	2,577,933	I.	250,783 9.7

Of the receipts of the week this year 32.4 and of the exports 47.7 per cent. were at New Orleans.

Coal Movement.

Coal tonnages for the week ending March 15 were:

	1879.	1878.	Increase.	P. c.
Anthracite.....	407,081	108,418	298,663	330.9
Cumberland and Broad Top.....	29,694	.....	.....	.....

A sharp competition, it is said, will be begun for the Philadelphia local market, the Delaware, Lackawanna & Western and the Delaware & Hudson Canal Company working against the Reading, which has hitherto chiefly supplied Philadelphia.

For January and February the shipments out of the pools on the Monongahela River above Pittsburgh were 112,100 tons coal and 289,800 bushels of coke.

Shipments of coal from Seattle, Wash. Ter., for the two months ending Feb. 28 were: 1879, 22,251; 1878, 9,983; increase, 12,268 tons, or 122.9 per cent.

Grain Movement.

Receipts and shipments for the week ending March 15 are reported as follows, in bushels, for the past six years:

	Northwestern.		Atlantic.	
Year.	Receipts.	Shipments.	Receipts.	Shipments.
1874.....	1,928,342	1,885,056	1,530,727	1,530,727
1875.....	1,881,183	1,118,840	1,618,858	1,618,858
1876.....	1,573,053	1,350,157	2,138,646	2,138,646
1877.....	1,195,040	608,134	1,721,935	1,721,935
1878.....	2,377,784	2,506,123	3,385,861	3,385,861
1879.....	2,936,291	2,007,797	4,006,145	4,006,145

The receipts at the eight leading Northwestern markets this year are a trifle less than for the preceding week but about the average for this year, during which the fluctuations have not been great. The shipments of the same weeks this year are much the largest of the year, the effect, doubtless, of reductions in rates. They are, however, not so large as in the corresponding week or in five other weeks of the winter of 1878, and do not nearly equal the receipts at these markets, where, in spite of low rail rates, stocks continue to accumulate, awaiting the opening of navigation. The receipts at Atlantic ports continue enormous, and were exceeded only one week last winter up to the same date; however, they are the smallest for five weeks this year. It may be noted that last year, when lake navigation opened on the 1st of April, the heaviest shipments of the season of closed navigation were made in the last half of March. Apparently there is to be a similar movement this year, the railroads carrying at rates equivalent to low water rates and endeavoring to clear away some of the accumulations in the West before the vessels can take it away from them.

Of the receipts at the Atlantic ports this year during the week reported, 44.1 per cent. was at New York, 20.2 at Baltimore, 18 at Philadelphia, 11.2 at Boston, 5.9 at New

Orleans, 0.4 at Portland, and 0.2 per cent. at Montreal. Baltimore's receipts are much the smallest for five weeks, Philadelphia's the largest since December, New York's about equal to its average since January. The indications are that the Baltimore & Ohio is not trying to get grain at current rates.

San Francisco grain receipts for the week ending March 15 were 18,284 barrels flour, 343,353 bushels wheat, 24,020 bushels barley, and 10,505 bushels other grain; total, reducing flour to wheat, 469,298 bushels.

Maintaining Lake Rates.

There was a convention of lake vessel-owners at Cleveland on the 19th, at which was organized the "Inland Vessel-Owners' Association of the Western Lakes," which contemplates a branch association at the several lake shipping ports, each with a board of seven directors, whose duties are set forth as follows:

"The board of directors shall meet at least once a week during the season of navigation, and at some appointed place, and agree upon a list of prices for the different articles freighted from that port, and such other as may be designated to their control by the Association, such prices to be issued by them in printed form. It shall be the duty of owners or masters belonging to the Association to report all freight engagements to the head-quarters of the Association of the port, if any exist; if not, they must act in strict accordance with the rates established by the board having such loading points under control. It shall be the duty of the board of directors of this port to notify all other associations of owners of the rate or change of rates from this port or other ports under control of this board at the earliest convenience."

"Resolved, That we, as members of this Association, pledge ourselves one to the other that we will withdraw our patronage from any agent that violates the rates established by the board of directors. If suspected, such agent shall be asked for an affidavit of the matter, and a non-compliance on the part of the agent shall be deemed confession, and such agent be posted at the head-quarters of the Association."

East-Bound Rates.

The Western roads, being supported by the trunk line representatives, agreed that from Monday, March 24, the east-bound rates should be fixed on the basis of 20 cents per 100 lbs. for grain, and 25 cents for fourth class and provisions from Chicago to New York, with the usual differences of 5 cents more to Boston, 2 cents less to Philadelphia and 3 cents less to Baltimore. The rates from St. Louis become 23 and 25 cents. For some days the prevailing rate on grain is said to have been 15 cents, and it is reported that there are considerable contracts out at those rates.

THE SCRAP HEAP.

Railroad Equipment Notes.

The Rhode Island Locomotive Works at Providence are building engines for the St. Louis, Kansas City & Northern, the Detroit, Grand Haven & Milwaukee and the New York Elevated roads.

The Gilbert & Bush Car Co., at Troy, N. Y., have shipped 14 passenger and baggage cars for a railroad of 3 ft. 6 in. gauge in New Zealand.

The Intercolonial Railway shops, at Moncton, N. B., are building several new locomotives, the first of which was turned out last week.

The Chicago, Rock Island & Pacific road is constructing 18 new locomotives, six of them 40-ton freight, six passenger and six pony engines.—Chicago Inter-Ocean.

The Taunton (Mass.) Locomotive Works have an order for six heavy ten-wheel engines, with negotiations pending for several other contracts.

Economy Foundry, at Beaver Falls, Pa., is making 800 car-wheels for the Pittsburgh & Lake Erie road.

The car works of John L. Gill, at Columbus, O., are building 200 box cars for the Scioto Valley road and 500 for the Erie.

The Taylor Iron Co. is rebuilding its foundry at High Bridge, N. J., which was burned down last week, as fast as possible.

The Harrisburg (Pa.) Car Co. has orders for 600 freight cars for the Canada Southern road.

Henry D. Carroll & Co., of Springfield, Mass., have a contract for 800 of their patent car ventilators for the New York Elevated road.

Iron and Manufacturing Notes.

The Paterson (N. J.) Iron Co. is making some heavy forgings for a light-house in Florida, and also some heavy forged work to go to San Francisco.

The rail-mill of the Elmira (N. Y.) Rolling Mills was started up last week on a large order. The bar-mill is full of work on orders.

The asbestos roofing of H. W. Johns & Co. has been in use on the starch factory of T. Kingsford & Sons, at Oswego, N. Y., over 15 years, and some of the first put on is in good condition. The roofs of these buildings cover several acres.

The furnace of the Stewart Iron Co., at Sharon, Pa., made 1,364 tons Bessemer pig iron in February.

The Continental Bolt Co., of Chicago, reports an increased demand, especially for track bolts and other railroad supplies.

The Buffalo (N. Y.) Forge Co. is working nearly its full number of men on car axles, steamboat work and mill shafting.

The Delaney Forge & Iron Co., at Buffalo, N. Y., is rebuilding a part of its works lately demolished by the explosion of a boiler. The company has many orders on hand.

The Buffalo (N. Y.) Nut & Bolt Co. reports business better than for several years past.

It is said that the North Penn Furnace, at Bitgen, Pa., has been sold to the Bethlehem Iron Co.

The Oxford Iron Co., at Oxford Furnace, N. J., has its furnaces in full blast, making Bessemer pig iron and spiegel-eisen.

The Indianapolis Rolling Mill has taken a large contract for iron rails for the Helena & Iron Mountain road in Arkansas.

Bridge Notes.

The Keystone Bridge Co., at Pittsburgh, has its shops very busy on its contract for the Cincinnati Southern road.

The King Iron Bridge Co., of Cleveland, O., has lately taken contracts for highway bridges of 122 ft. span at Bay-bridge, Me.; 160-ft. span in New York state; 85-ft. span in Illinois, and 130-ft. span, three spans, in Iowa.

The Passaic Rolling Mill has put in a bid, by request, for furnishing the material and building an iron pier at Cadiz, Spain, to be 1,500 feet long by 50 feet wide, and to take anywhere from 2,000 to 3,000 tons of iron. The chief rolling mills of Germany, England and France are to compete for the work, and the hope that the bid of our local mill may prove acceptable is based largely on the fact that those foreigners generally contemplate only heavy and clumsy structures, while the American method inclines to a lighter style, much less costly and yet of equal strength and durability. In other words the mills of the old country achieve

the strength and durability required, but at a much greater cost. The pier is to be built, not by the Government, but by a private corporation.—Puterson (N. J.) Press.

Spikes.

In Paterson, N. J., the other day, as a German farmer was driving up to a railroad crossing, the flagman warned him that a train was coming. "I guess I beat dat train, or else I see some fun," answered the granger, and drove on. Two frightened horses, a load of grain sowed broadcast over the neighborhood, a pile of kindling-wood with a wheel-tire or two mixed in, and a German sitting in the ditch were seen about a minute later. He had not beaten the train, but he had seen some fun.

That Maine man, who believed that 18 in. was the best gauge for trunk lines, and 12 in. for branch roads, has seen the error of his ways. They were too broad, and he now advocates a single rail. He urges that that rail should be made as narrow as possible.

A drunken man at Red Rock, Pa., the other day, started to take a little walk, and on the way picked up a bag containing several cans of nitro-glycerine, which he slung over his shoulder. Soon the good people of Red Rock were startled by an explosion and a shower of small particles of flesh and bone. Investigation showed nothing but a big hole in the ground—man, whisky, nitro-glycerine and all were distributed impartially over the neighborhood.

A Canada company spent its last dollar in buying rails in England the other day, and now finds that \$40,000 duty will be required will be due on them, under the new tariff, when they arrive in Montreal.

An Advertising Ticket-Holder.

The Toledo Commercial says: "The new idea copyrighted by the Wabash, is a pocketbook with pockets for railroad and sleeping-car tickets, the advertisement being printed on pasteboard, folded and cut into the shape of a *porte-monnaie*, and, besides the display of the 'Friendly Hand' on the outside, a full and reliable account of the connections on the inside, the whole being in the shape of a convenient railroad sleeping-car ticket and small change pocket-book, besides being a condensed time-table, valuable to all travelers, going east or west."

Noise from Vacuum Brakes and Safety Valves.

In the Legislature yesterday the Railroad Commissioners presented a communication in relation to the noise produced by vacuum brakes and safety valves on railroad locomotives. Of the principal railroads in this state only six use the vacuum brake, and one of these, with only six engines equipped with the brake, is about to abandon it entirely. Of the 50 engines so equipped on the Boston & Albany road 48 are supplied with McGowan's muffler and two with an ejector, both of which devices operate well. The muffler works well on the Old Colony, and all the engines will be supplied with it. The Connecticut River has mufflers which sufficiently suppress the noise. The New York & New England road is about to abandon the use of vacuum brakes. The Boston & Lowell has 32 engines equipped with 10 vacuum brakes; has tried five different mufflers with more or less success, but as they reduce the efficiency of the brake no muffler has generally been applied. The Boston & Maine has 40 engines equipped with the vacuum brake. Four kinds of mufflers have been applied, and one made by the company will be applied to all engines when the infringement of certain patents is determined. The Commissioners are satisfied that the noise caused by the brake can be effectually removed.

With regard to the noise by the escape of steam from the pop safety valve there is a greater difficulty. The commissioners regard the Ashton blow-back valve as the most effective, and entirely removes the cause of complaint. Most of the devices invented have been patented, and lack of agreement as to price between the railroads and the patentees has prevented their use. If this were otherwise the difficulty could be easily overcome.—Boston Advertiser, March 18.

Heating Cars by Hot Water.

A train was run over the Pennsylvania Railroad yesterday for the first time, between this city and New York, heated and ventilated by the recently-perfected apparatus which the company has successfully tested on trains running from Altoona over the mountains during the past winter. The new method is by means of heated water passing through pipes. In one of the cars—generally the baggage-car—there is an ordinary portable engine, in which hard coal is burned, so that no dust or smoke arises. On one side of the boiler, just above the lowest gauge-cock, are two pipes, one to the right, the other to the left, running down through the floor of the car. Attached to one of these is an inch and a-half steam hose-pipe, capable of bearing two hundred pounds cold water pressure, passing down to the rear car, around which it goes and returns to a pipe on the other side of the boiler. Into this is pumped the hot water, passing through and back again into the boiler, so that the same stream of water is constantly used. Near the door of each car is attached an elbow, going up into the car, along the box at the side and then under the seats, forming a loop like the letter U, at the end of which is a register through which the heat comes, and over it is a galvanized iron cover, thus preventing the heat from rising directly underneath. This is under each seat, and beneath each car are four cold-air boxes so constructed that no matter which direction the car is moving, the air is caught, and, passing up into the car over the water-pipes, scatters the hot air, throwing it up to the top, where it passes out of the ventilator, thus keeping a constant current of pure air through the car. The pipes are of sufficient strength to stand a cold-water pressure of 200 pounds, and so arranged that in case of separation of the cars, or breakage, the supply can be checked for a long enough time to enable a joint or connection to be made, for which purpose extra attachments are carried on the train. The entire apparatus, as arranged, does away entirely with dust, keeps the cars fully ventilated and gives additional room in the car equal to eight passengers, while at the same time it makes traveling perfectly safe. It was designed at the office of the Mechanical Engineer of the company, at Altoona, and is the property of the company. The experiment yesterday was entirely satisfactory.—Philadelphia Times, March 22.

How Pittsburgh Coal is Carried.

In Pittsburgh and vicinity there are 50 operators or firms engaged in the coal-business; about one-half of whom sell at the mines, the other half are shippers engaged in running coal to Southern ports. The shipments for Southern consumption from Pittsburgh amount annually, on an average, to 80,000,000 bushels of coal and 20,000,000 of coke, which is sent south by the shippers on the tides as they occur. For this purpose they employ 96 tugs or tow boats and about 1,500 barges and shells in which the coal is transported. Each barge costs about \$1,000 and carries from 12,000 to 13,000 bushels. The shells cost about \$500 and they carry about 24,000 bushels. The barges, when unloaded at their destination, are returned to the mines; the shells are generally sold in the South and broken up for other uses by the purchasers.

On an average there are ten coal tides or rises at Pitts-

burgh during the year, which occur suddenly, and frequently last only from 24 to 36 hours. The barges and shells must, therefore, be kept loaded and ready for departure at an hour's notice. When the opportunity arrives, the tows are lashed to the tugs, each taking about 10 barges, containing, say, 150,000 bushels of coal, the great length of the tows and the short time allowed by the rapidly-falling river requiring the most expeditious movements.

By this admirable barge system coal is kept at a price but little above that of Pittsburgh to the cities above the falls of the Ohio, the expenses of running the coal to Louisville, including the cost of returning the barges to the mines, being only about 1½ cents per bushel.—*Louisville Commercial*.

It may be added that Pittsburgh coal thus receives what is probably the cheapest freight transport in the world—so cheap, indeed, that the railroads through the coal regions of Ohio and Kentucky cannot compete with Pittsburgh for the supply of the River towns, even when comparatively near by.

OLD AND NEW ROADS.

Atchison, Topeka & Santa Fe, in Mexico.—In the Massachusetts Legislature last week a bill was introduced providing for the organization of companies in the state to build railroads in foreign countries. The bill substantially extends the provisions of the general railroad law to such companies, with some necessary changes. It was stated by Mr. Osgood, of Salem, who introduced the bill, that "it was for the benefit, at the outset, of the Atchison, Topeka & Santa Fe Railroad, which proposes to extend its road into Mexican territory. The corporators of the road are largely Massachusetts men, and wish the authority of their own state given to the act of incorporation permitting them to build in a foreign country, which is demanded by the Mexican government before the road can be built. An offer has been made to incorporate the company in Pennsylvania with the powers asked for, but the persons most interested prefer to be incorporated in their own state. Should the bill pass, there will be a corporation tax of several thousand dollars to come into the state treasury. The railroad committee will take speedy action in the case."

"A land grant has been obtained from the Mexican government to build a railroad through the valley of Sonora, extending from Guaymas on the Gulf of California to the borders of Mexico. Charters to construct railroads in foreign countries have been granted by the state of New York, but not by Massachusetts, and probably by no other state. If the bill should pass, the persons moving in the matter will offer such inducements to capitalists as will unquestionably lead to the construction of the projected road. The Atchison, Topeka & Santa Fe Railroad is being pushed rapidly toward the Mexican frontier. The length of the new road will be between three and four hundred miles, and will form a through line to the Pacific, under the control of the Atchison, Topeka & Santa Fe."

Atlantic & Great Western.—At the meeting in London, March 11, called by James McHenry, the following resolutions were passed:

"1. That the lease into which the trustees have signified their intention to enter is, as far as its provisions have been disclosed, one involving disastrous consequences to the bond and shareholders, and is wholly inconsistent with the scheme of reconstruction under which they have been authorized to act."

"2. That it is desirable that, without departing from the general scheme of reconstruction, its provisions should be reconsidered and further defined in order to adapt it to the altered circumstances of the case, and to agree upon an equitable basis in the interests of the several classes concerned in the Atlantic & Great Western Railway."

"3. That the recent action of the trustees in reference to the proposed lease renders it impossible for the bond and shareholders any longer to repose confidence in their judgment."

"4. That a committee be appointed to carry into effect the decisions arrived at by this meeting, and to communicate at an early date to the bond and shareholders the course which the committee consider to be most beneficial to the interests of the company."

"5. That the following gentlemen be invited to join the committee for the purposes mentioned in the fourth resolution: Right Hon. Viscount Barry, M. P.; Thomas Cave, Esq., M. P.; Lord Kinnaird, M. P.; Right Hon. Lord Robert Montagu, M. P.; Alexander McDougal, Esq.; James McHenry, Esq.; Francis Mowatt, Esq.; James Shepherd, Esq.; Sir Henry Tyler, Sir Charles Young, Bart."

Baltimore, Napoleon & Michigan.—This company has been organized to build a railroad from Napoleon, O., northward through Henry and Fulton counties to the Michigan line, about 20 miles. The capital stock is fixed at \$50,000.

Canada & Atlantic.—This company, formerly the St. Francis & Megantic, has made formal application to the Canadian government for authority to build a bridge over the St. Lawrence at Coteau, a short distance above Montreal.

Canadian Pacific.—The contract with Frazer, Grant & Pittblado for the construction of the 67 miles from Winnipeg, Manitoba, eastward, has been signed, and the contractors have started for Winnipeg to arrange for beginning work. The section includes some very heavy and expensive work. The amount of the contract is \$4,130,000, or about \$61,800 per mile. The lowest bid was nearly \$600,000 less, but the contractors failed to furnish security as required.

Central Pacific.—The San Francisco *Evening Post* says: "The following is the amount of business transacted by the Central Pacific Railroad Company between San Francisco and Oakland, Alameda and Berkeley, for 1878: Single trip tickets, 2,272,696, which amounted to \$344,737.05; round trip tickets, 838,522, amounting to \$111,164.85; number of commutation tickets, 42,856, amounting to \$128,572.00. Making equal in total to 5,681,978 passengers carried, and the sum total realized, \$584,472.00. The following footings are given of the business done by this ferry since 1872: The number of passengers carried in 1873 was 2,655,671, netting \$306,235.15; in 1874, 3,192,904 persons were carried, netting \$348,448.85; in 1875, single trip passages, 4,028,310, \$437,306.20; in 1876 the single trips were 4,909,460, earnings, \$524,311.75; in 1877 the single trips were equal to 5,570,555, earnings \$585,351.70. This exhibits a decrease since 1877 of the number of single trips, and of earnings, \$777.90. This, however, is easily accounted for, as the narrow gauge railroad began in July to make regular trips to Alameda with their fine steamers, which took a great many people to Alameda who would otherwise have gone via Oakland."

Chicago & Alton.—Track on the Kansas City Extension has reached the terminus at Kansas City, Mo., and there now only remains the bridge over the Missouri at Glasgow to be completed. It is expected that this will be done by April 15, and the road will then be opened for business.

The extension, built under the organization of the Kansas City, St. Louis & Chicago Company, is 162 miles long, leaving the line of the leased Louisiana & Missouri River road at Mexico, Mo., and running nearly due west to Glasgow, where it crosses the Missouri and continues parallel to and south of that river to Kansas City. East of Glasgow the line is south of and for some 25 miles pretty close to the St. Louis, Kansas City & Northern; west of Glasgow it is between the river and the Missouri Pacific road, generally nearer the river, and not approaching the road very closely until within 10 or 15 miles of Kansas City. It gives the Chicago & Alton a line under its own management all the way from Chicago to Kansas City, 487 miles long.

Though nominally under a separate organization the road is really owned by the Chicago & Alton, that company receiving all the stock and bonds issued by the Kansas City, St. Louis & Chicago Company. Its cost has been met by an issue of Chicago & Alton bonds, based upon the bonds of the new road held in trust.

Chicago, Burlington & Quincy.—At the annual meeting in Chicago, March 26, a resolution was adopted asking the officers to consider whether it was not advisable to stop issuing all free passes, except to employees traveling on the company's business. A resolution that directors be instructed to suspend all work on Sunday, except when indispensable, was laid over for future consideration.

Chicago & Lake Huron.—It was expected that a final decree of foreclosure would be granted this week by the United States Circuit Court against the section from Port Huron, Mich., to Flint, the old Port Huron & Lake Michigan road.

Chicago, Milwaukee & St. Paul.—The following statement has been made for the year 1878:

Gross earnings	\$8,451,767.28
Expenses, including taxes	1,792,313.04

Net earnings	\$6,659,454.24
Interest on m'tg's debt paid in 1878	\$2,135,730.56
Less interest and exchange received	13,430.67

	2,122,299.89
Net balance	\$1,537,154.35
Two dividends each 3½ per cent. on preferred stock	859,563.80

Balance undivided for 1878	\$677,590.55
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On this showing the usual semi-annual dividend on the preferred stock has been declared.

Chicago & Northeastern.—In the matter of the application for the appointment of a Receiver for this road the United States Circuit Court at Detroit gave its decision March 20. The Court agreed that the Chicago & Lake Huron Railroad Company had a first lien upon the Chicago & Northeastern for the right of way, labor of employees, etc., and for money misappropriated by William L. Bancroft, the former Receiver of the Chicago & Lake Huron. Judge Baxter emphatically condemned the manner in which Bancroft abused the trust reposed in him, and alluded to his misappropriation of about \$300,000 or \$400,000 in terms of the severest censure. The court further held that Wm. H. Vanderbilt had knowledge, before his purchase of the equities of the complainant, Burns, that the Chicago & Northeastern had a legal corporate existence, and that a large number of bondholders of the Chicago & Lake Huron consented to the construction of the Chicago & Northeastern, with full knowledge of the fact that that road was being built by an independent corporation; also that Bancroft's associates in the incorporation of the Chicago & Northeastern were aware of the fact that Bancroft was using money and materials in its construction which rightfully belonged to a separate corporation—the Chicago & Lake Huron.

The court ordered Mr. Vanderbilt to file a bond with 20 days for payment of the rightful indebtedness of the Chicago & Northeastern incurred in construction, and also to deliver the road in good condition, if, on final hearing, it shall be found that the title is in the Chicago & Lake Huron. In default, a receiver is to be appointed to take charge of all the property and equipments. This includes the refunding of money misappropriated from the Chicago & Lake Huron funds for the construction of the Chicago & Northeastern. The court also found that two miles of the road within the corporate limits of Flint, and now occupied by the Chicago & Northeastern, legally belonged to the Chicago and Lake Huron, and Receiver Peck was instructed to take them under his charge. The Flint capitalists having advanced money to help the construction of the Chicago & Northeastern, the Chicago & Lake Huron bondholders are estopped from asserting their right in the road, as against the persons in Flint.

Chicago, Rock Island & Pacific.—A survey has been made for a branch line from Bennington, Ia., on the Winterset branch, southward about 25 miles to Osceola, on the Chicago, Burlington & Quincy. This may be regarded as an offset to the branches which the Burlington road has been building up into the Rock Island's territory, and especially to the proposed extension from Knoxville to Des Moines. The company is now laying steel rails on the 40 miles of track between Avoca, Ia., and Council Bluffs. When this work is completed, it will have a steel track on the whole main line from Chicago to Council Bluffs.

Cincinnati, Hamilton & Dayton.—Julius Dexter has begun a suit against the Cincinnati, Hamilton & Dayton and the Cincinnati, Hamilton & Indianapolis railroad companies, upon two of the bonds issued by the latter company and guaranteed by the former, to recover the interest due upon them for the year 1878. He sets out that the bonds were issued in the purchase of the Junction railroad at judicial sale in 1872, to the creditors and lien-holders of that road, it having been purchased by the Cincinnati, Hamilton & Dayton Company, which organized from among its directors the Cincinnati, Hamilton & Indianapolis Company, and invested them with the title of the road; that bonds were executed to the amount of \$2,500,000, of which \$1,690,000 were delivered to the creditors and lien-holders of the Junction Railroad Company, the balance of the bonds remaining unused in the hands of the Cincinnati, Hamilton & Dayton Company. These bonds were executed by the Cincinnati, Hamilton & Indianapolis Company, and have on the back the guarantee of the Cincinnati, Hamilton & Dayton. Default was made on the interest last year and he now seeks to recover.

Dayton & Southeastern.—Receiver Gimperling's statement for February is as follows:

Earnings for February	\$7,954.03
Previously	46,015.73

Total since Aug. 9, 1878	\$53,969.76
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Expenses for February (67 per cent.)	\$5,331.91
Expenses previously	28,812.20
Total rents, etc.	1,641.05
Total betterments	10,445.85

	44,231.01
Balance, surplus, Feb. 28	\$9,738.75

Four flat cars were bought in February and 10 tons of new rails for sidings.

Clarinda & St. Louis.—This company has been organized to build a short line from Clarinda, Ia., to connect with the St. Louis, Kansas City & Northern's new line to Council Bluffs. Capital stock \$50,000.

Danville & Northern.—It is proposed to build a railroad from Danville, Pa., northward into the lumber and coal regions of Sullivan County. The road as projected would be about 40 miles long.

Eastern Extension.—A new contract has been concluded by which the Halifax & Cape Breton Railroad & Coal Company is to complete this line from New Glasgow, N. S., to the Straits of Canso, and to establish the steam ferry across the straits to Cape Breton. The former contractor, Abbott, joins in the new agreement. The company is to receive the government land subsidy, and also the Pictou branch of the Intercolonial, from Truro to Pictou Landing, 51 miles of finished road.

East River Bridge.—The New York Court of Appeals has sustained the decision of the Supreme Court ordering a peremptory *mandamus* to issue against the Comptroller of the city of New York, to require him to issue the city bonds called for by the trustees of the bridge. This will insure the continuation of the work.

Florida Railroad Projects.—The Florida Legislature has been going into railroad business wholesale this year. Bills have been introduced (and nearly all passed) to incorporate or give aid to the following companies:

Black Creek & Starke Railroad.
Chattahoochee & Pensacola Railroad.
Gainesville, Ocala & Charlotte Harbor Railroad.
Jacksonville, St. Augustine & Indian River Railroad.
Lake Eustis, Orlando, Kissimmee & Tahopkaliga Railroad.
Lake Jessup, Osceola & Kissimmee Railroad.
Lake Monroe & Orlando Railroad.
Midland Railroad, Canal & Drainage Company.
St. Johns, Lake Eustis & Gulf Railroad.
Santa Fe Canal.
Silver Spring, Ocala & Gulf Railroad.
Sterling & Jacksonville Railroad.
Tampa, Peace Creek & St. Johns Railroad.

Most of these are old projects and very few of them are likely to be built just yet.

Freehold & Jamesburg.—It is said that surveys have been made for an extension of this road (which is controlled by the Pennsylvania) from Sea Girt, N. J., northward to Long Branch, through Ocean Grove, Asbury Park and the other summer resorts along the sea shore. The road would be about 12 miles long, and parallel and close to the New Jersey Central's Long Branch Division. It would not be costly to build, but a large sum would be required to pay for the right of way.

Great Western, of Canada.—A dispatch from London, March 21, says: "This company's officers have announced the results of the working of the last half-year. They admit that after crediting the reserve funds according to the revised basis and the payment of a dividend on the preference stock for the half year, and also of arrears of the dividend of the previous half-year, they are carrying forward a balance of about \$4,000."

Gulf, Colorado & Santa Fe.—Under authority of a law lately passed, the County Court of Galveston County, Texas, has decided to transfer the \$500,000 stock in this company owned by the county to a syndicate of Galveston business men, provided they shall give a satisfactory bond that they will extend the road to Belton, work to be begun without delay and completed by Dec. 1, 1882.

Illinois Central.—Notice is given that eighteen Dunleith & Dubuque Bridge bonds have been drawn for redemption May 1, 1879, at \$1,050 each, at the office of the Illinois Central Company in New York. Interest on the drawn bonds will cease May 1. The numbers drawn are: 7, 90, 95, 108, 149, 161, 212, 271, 276, 277, 359, 363, 373, 404, 428, 447, 484 and 499.

Indianapolis, Delphi & Chicago.—Track on this road is reported laid to Delphi, Ind., 12¼ miles southeast from the late terminus at Monticello, and 38 miles from the western terminus at Rensselaer.

Kingston & Pembroke.—At the recent annual meeting in Kingston, Ont., it was reported that the earnings for 1878 were \$37,287, an increase of \$5,818, or 18 per cent., over 1877. There was an increase in both freight and passengers. The Ontario government has agreed to give the company a subsidy of \$8,000 a mile for an extension of 30 miles from the present terminus at the Madawaska River. It was proposed to build branches to Tamworth and Carleton Place if the people will vote a sufficient bonus.

Lake Champlain & St. Lawrence.—Work has been begun on a section of this road from Stanbridge, P. Q., north to West Farnham, about 20 miles.

Leavenworth, Council Grove & Sterling.—This company has been organized to build a narrow-gauge road from Leavenworth, Kan., southwest by way of Council Grove to Sterling, about 220 miles. The capital stock is fixed at \$500,000. The office is at Sterling, Rice County, Kansas.

Louisiana Western.—This is the company which is building the section from Vermilionville, La., to the Sabine River, of the rail line from New Orleans to Houston. Work is now progressing steadily on the road, and a quantity of rails have been received. It has been decided to cross the Sabine at Alligator Bayou, about four miles above Orange, Tex., and to run down to Orange on the west side of the river.

Louisville, New Albany & St. Louis.—A new survey has been made for this road from New Albany, Ind., to the end of the completed road at Princeton. The estimated cost of the road is \$1,480,000, of which it is hoped about \$400,000 can be raised along the line.

Metropolitan Elevated.—The New York Superior Court has dismissed the suit brought by the New England Iron Company to recover \$4,000,000 for alleged breach of a contract made to build the road. The dismissal is on the ground that by its own corporate acts the Iron Company has furnished the evidence of its inability to perform the contract on its part. The Court held, in conclusion, that if its deductions from the evidence were correct, "It follows that it conclusively appears by the report of the New England Iron Company that since October, 1873, and during the years 1874 and 1875, it was not ready and able, though it may have been willing, to perform the contract on its part to be performed, and hence the contract made in 1876, between the Gilbert Company and the New York Loan & Improvement Company, which, in passing, it may be said, was for the erection and completion of a road different in many respects from the road contemplated by the contract made with the New England Iron Company, and over a changed route pursuant to new powers conferred by the Legislature, did not constitute a breach for which the plaintiff can main-

tain an action. The complaint must be dismissed with costs."

New York, Lake Erie & Western.—It is announced that the National Park Bank has withdrawn its suit against the directors of the old Erie Company, brought to compel them to refund the amount of a dividend alleged to have been fraudulently declared.

President Jewett has written a letter denying certain reports that the company was trying to place a new loan. He states that there is no foundation whatever for such rumors.

New York & Oswego Midland.—An adjourned meeting of stockholders was held in Norwich, N. Y., March 20, to consider the plans for securing the stockholders a share in the reconstruction of the company. Most of those present represented towns along the line. Several addresses were made, but no definite action was taken.

Ontario Railroad Projects.—The Toronto Monetary Times says:

"On the closing day of the session of the Provincial Legislature of Ontario, Tuesday last, the 11th inst., his Honor the Lieutenant-Governor assented to amendments in the charters of the following railway companies:

"The Ontario Central; the Leamington, Comber & Lake St. Clair; the Stratford & Huron; the Hamilton & North-western; the Georgian Bay & Wellington; the Whitby, Port Perry & Lindsay; the Whitby & Bobcaygeon Railway Extension Company; the Belleville & North Hastings; the acts relating to the Brantford, Norfolk & Port Burwell Railway Company have been amended. Act respecting the Grand Junction Railway Company; the Lake Simcoe Junction; Act to legalize certain by-laws and debentures of the County of Kent in aid of the Huron & Erie Railway Company; Act respecting the Yorkville Loop Line Railway Company.

"The following railway companies have been incorporated: The Waterloo, Wellington & Georgian Bay; the Grey & Walkerton; the Snowdon Branch and the Windsor & Essex-Centre."

Pennsylvania.—This company's statement for February shows, as compared with February, 1878, for all lines east of Pittsburgh and Erie:

An increase in gross earnings of \$375,130
A decrease in expenses of 52,976

Net increase \$428,086

For the two months ending Feb. 28 the same line shows, as compared with the same period last year:

An increase in gross earnings of \$529,259
A decrease in expenses of 47,100

Net increase \$569,419

For the two months all lines west of Pittsburgh show a surplus over all liabilities of \$229,995, being a gain of \$97,204 over the same period in 1878.

Pugwash Branch.—Surveys have been completed for this road, which is to run from the intercolonial at River Philip, N. S., to Pugwash harbor. The distance is 18½ miles, and a very easy line has been found.

Rochester & Genesee Valley.—This company was last week organized in Rochester, N. Y., to build a railroad on the Genesee Valley Canal from Rochester, by way of Olean, to Mill Grove, a distance of 113½ miles. The capital stock was fixed at \$1,140,000. A committee was appointed to obtain from the New York Legislature an act to authorize the company to use the canal as a road-bed.

Sabine Pass & Northwestern.—A writer in the Kaufman (Texas) Star, who urges the prosecution of the work, says "The status of the Sabine Pass road is about as follows: They have a contract with the Frenchman, De Pardonnet, to go to Europe and borrow money for them, but he will borrow none, nor take any steps in the matter until 30 miles are built. To meet this difficulty, Messrs. C. C. Campbell and W. B. Hotchkiss, to whom has been awarded a contract to build the entire road, agree to advance the money to build the first 35 miles."

St. Joseph & Denver City.—It is reported that a controlling interest in this road has been bought by parties interested in the Union Pacific. Probably it could be bought very cheap.

St. Louis, Kansas City & Northern.—In the long-pending suit of Kitchen against this company, brought to set aside the sale of the North Missouri road in 1871 and its conveyance to the present company, the Missouri Supreme Court on March 24 affirmed the judgment of the Circuit Court in favor of defendants. This establishes the validity of the sale, and relieves the company from further litigation on this point.

St. Louis, Keokuk & Northwestern.—This company gives notice to car accountants and others that, as fast as practicable, it is re-lettering all its cars "Keokuk & St. Louis Line." Mileage of such cars should be reported to J. C. McKee, Car Accountant of this road, at Keokuk, Ia.

St. Louis & Southeastern.—Auditor Young's statement for February is as follows:

St. Louis Div. Ky. Div. Tenn. Div. Entire line.
Gross earnings \$45,749.04 \$28,720.19 \$14,764.31 \$89,233.54
Expenses 36,533.26 21,797.80 10,544.45 68,875.51

Net earnings, \$9,215.78 \$6,922.39 \$4,219.86 \$10,358.03

Per cent. of exps., 79.94 75.95 71.25 77.21

As compared with February, 1878, the entire line shows an increase of \$6,508.52, or 7.9 per cent., in gross, and of \$5,174.38, or 34.0 per cent., in net earnings.

St. Paul & Pacific.—There has been some trouble between this company and the contractors who have been working the Canadian Pacific branch line from Winnipeg to St. Vincent, and that line was closed for a time. It is now stated, however, that a new lease of the branch line has been made, under which it will be worked by parties friendly to the St. Paul company, and will be virtually under the control of that company.

Sharpville.—The Pennsylvania Company last week took up the connections between the Erie & Pittsburgh and this road at Sharpville, Pa., thereby not only cutting off the rail connection of the Sharpville road, but also keeping it from the canal outlet. The mines on the road are thus, for the present, deprived of all outlet. The Sharpville Company has appealed to the courts for the necessary order to compel the renewal of the connection. The motive for this action is said to be to stop the shipment of coal from the Sharpville road to Cleveland.

Southern Minnesota.—It is said that this company is about to bring suit against the St. Paul & Sioux City in the hopes of establishing a claim to some 200,000 acres of land now held by the latter company and situated near the point where the Southern Minnesota will cross it when extended.

Southern Pacific.—At latest accounts the track had reached a point 110 miles eastward from Yuma. Work is progressing steadily on the 125 miles remaining to reach Tucson, Arizona.

Spencer.—It is probable that the difficulties between this company and the contractor will be settled by arbitration. The directors are preparing to put the road in good order, so that it may be opened for travel.

Texas Railroad Regulation.—The managers of all the Texas railroads recently addressed a memorial to the Governor, representing that the article limiting freight rates in the civil code just adopted in that state would, if enforced, work great inequality and injustice, and would practically result in bankrupting nearly all the railroads in the state. The Governor has sent a special message to the Legislature, setting forth that the regulation of rates is a difficult matter, requiring great care, and suggests that the enforcement of the new law be suspended, or at any rate made optional with the Attorney General.

Toledo & Ann Arbor.—Surveys have been completed for the proposed extension from Ann Arbor, Mich., to Pontiac. Construction will be begun as soon as \$1,000 a mile and the right of way are contributed along the line.

Toledo & Morenci.—This company has been organized to build a railroad from Toledo, O., west by north to Morenci, Mich., 33½ miles. It is to be a narrow-gauge road and to follow nearly the line of the plank road between the two places.

Toledo & Western.—Arrangements are said to be nearly completed for the building of a road from Toledo, O., due west to La Grange, Ind., about 100 miles, with a branch to Kalamazoo, Mich.

Troy & Greenfield.—The Massachusetts Supreme Court on March 25 heard arguments on the demurrer interposed by the state to the bill filed by the old Troy & Greenfield Company to recover possession of the road. Decision was reserved.

Valley, of Ohio.—At a special meeting in Cleveland, O., March 19, the stockholders voted to ratify the contract concluded by President King for disposing of \$600,000 of the company's bonds in New York.

Worcester & Nashua.—At a meeting held in Nashua, N. H., March 22, the Nashua & Rochester stockholders voted to accept the proposal to reduce the rental dividends from 6 to 3 per cent., with the provision that, whenever the Worcester & Nashua is able to pay a dividend over 3 per cent. per year to its own stockholders, the same amount shall be paid on the stock of the leased road as on that of the lessee. The vote was 5,841 shares in favor of accepting the proposition to 406 against. The capital stock of the Nashua & Rochester is \$1,308,000, but of this the lessee owns \$475,300, so that the net relief derived from the reduction of dividends will be \$24,981 a year. In addition to the dividends, interest is paid on \$700,000 bonds of the leased road.

The Worcester & Nashua Company has petitioned the Massachusetts Legislature for leave to mortgage its road to secure its creditors. It has a funded debt of \$1,000,000, but, like many of the older Massachusetts roads, its bonds are not secured by mortgage. It was formerly very prosperous, and for several years paid 10 per cent. dividends. Its troubles have chiefly been brought about by the lease of the Nashua & Rochester road, the earnings of which have been much less than expected. The net earnings of the leased road last year were \$49,531, while the rental was \$120,448, which will be increased this or next year by \$15,000 to \$20,000 for taxes under the new tax law in New Hampshire. It is felt that this will be too great a burden to carry, and hence the movement to reduce the rental of the leased road and the interest on the company's own bonds. To compensate for this reduction in interest it is proposed to give bondholders the additional security of a mortgage. As matters at present stand, the rental of the leased road is a prior charge to the interest on the company's own bonds, but by the new arrangement the bondholders will be given a prior lien on the property. On this account the authority to mortgage is opposed by some of the Nashua & Rochester stockholders, who think it unjust to deprive them of their present priority.

ANNUAL REPORTS.

Maine Central.

This company worked the following lines for the year ending Dec. 31, 1878:

Portland, Me., by Augusta to Bangor Miles.
Cumberland Junction, by Lewiston to Waterville 73.0
Brunswick to Lewiston 23.0
Brunswick to Bath 9.0
Crowley, by Leeds Junction to Farmington 47.0
Waterville to Skowhegan 19.0

Total owned 307.5

Belfast & Moosehead Lake, leased 33.5

Newport & Dexter, leased 14.0

Total worked 355.0

The equipment consists of 60 engines; 59 passenger and 26 mail and baggage cars; 690 box and 512 flat cars; 32 service cars, 18 snow-plows and 11 flange-scrappers. One engine, one passenger, two baggage and 15 other cars were added during the year.

The balance sheet, condensed, is as follows:

Stock (\$11,718 per mile) \$3,003,300.00
Stock bonds 16,800.00
Bonded debt (\$28,320 per mile) 8,708,942.04
Interest scrip 26,092.00
Portland & Kennebec stock unconverted 1,000.00
Accounts and balances due 26,367.49
Profit and loss 369,064.81

Total \$12,751,566.34

Construction and equipment (\$37,980

per mile) \$11,678,472.78

Androscoggin lease 798,333.33

Stocks, bonds, accounts 34,975.30

Cash, cash assets and materials 269,784.93

Total \$12,751,566.34

The bonded debt was increased \$2,930.98 during the year.

The annual interest charge is now \$569,180.37.

The traffic of the year was as follows:

Train mileage: 1878. 1877. Inc. or Dec. P. c.
Passenger carried 498,343 498,143 I. 200 0.4
Freight 355,668 395,159 D. 39,491 10.6
Service 234,847 184,792 I. 50,055 27.1

Total 1,088,858 1,078,094 I. 10,764 1.0

Passengers carried 565,000 511,345 D. 45,339 7.4

Passenger mileage 29,449,197 22,740,125 D. 2,290,928 10.1

Tons freight carried 329,811 280,830 D. 51,019 13.4

Tonnage mileage 21,196,581 25,030,298 D. 3,833,717 15.3

Av. train load: 41.04 45.65 D. 4.61 10.1

Freight, tons 39.30 43.34 D. 3.75 5.9

Average receipt: 3.05 cts. 3.03 cts. I. 0.02 ct. 0.6

Per ton per mile 3.32 " 3.33 " D. 0.01 " 0.3

There was a serious decrease of traffic, but rates remained

very nearly stationary. The freight rates appear pretty high, but a large part of the traffic is local, and the hauls short.

The earnings for the year were:

1878. 1877. Inc. or Dec. P. c.
Passengers \$823,718.24 \$688,056.37 D. \$135,661.87 15.4
Freight 702,638.09 833,540.59 D. 130,872.50 15.7
Mail, express, etc. 90,534.42 98,492.39 D. 7,957.97 8.1
Miscellaneous 23,740.71 34,147.65 D. 10,406.94 38.5
Total \$1,440,661.46 \$1,654,237.00 D. \$213,575.54 12.9
Expenses 840,704.72 1,003,538.05 D. 162,833.33 16.3

Net earnings \$599,956.74 \$650,698.95 D. \$50,742.21 7.7

Gross earn. per mile 4,058.20 4,569.82 D. 601.62 12.9

Net earn. per mile 1,690.02 1,832.05 D. 142.03 7.7

Per cent. of expenses 58.35 60.06 D. 2.31 3.8

The net earnings exceeded the interest charge by about \$30,000. The income account, condensed, was as follows:

Net earnings \$599,956.74
Bonds exchanged 4,700.00
Notes, etc. 21,591.84
Due on rentals, coupons, etc. 21,685.99
Balance from 1877, less \$13,383.17 charged off 367,296.40

Total \$1,015,141.06

Interest \$572,225.59

Rentals 54,000.00

Bonds paid 6,109.02

Real estate, old expenses, etc. 79,986.22

Balance at close of year \$304,780.23

Renewals of road included 618 tons of steel rails, 1,036 tons of iron rails and 81,327 new ties; 2,065 old rails were repaired and relaid. A large amount of work was done on bridges; 306 feet iron and 1,156 feet wooden truss bridging were built. A number of small bridges were rebuilt, and 728 feet of trestle filled in. Several small stations were supplied with new buildings and others repaired.

The loss in business is ascribed chiefly to general depression, which is believed to be nearly at an end. An improvement is also looked for from several local lines connecting with this road, which are projected and will probably be built. Experience has shown the wisdom of the assistance given to the European & North American and the New Brunswick & Canada in changing their gauge.

Under the adverse decision of the United States Supreme Court the company has paid \$50,280.12 to the state in settlement of back taxes heretofore in dispute. The report dwells at considerable length on the injustice of the high rate of taxation imposed on railroad property by the state.

Atlantic & Great Western.

The property worked by the Receiver of this road consists of the main line from Salamanca, N. Y., to Dayton, O., 387½ miles; to Franklin branch, from Meadville, Pa., to Franklin, 33½ miles; the leased Cleveland & Mahoning Valley, from Cleveland, O., to Pennsylvania line, 80 miles; the leased Sharon branch, from state line to Sharon, Pa., 1½ miles, and the leased Sharon Railway, from Sharon to Sharon Junction, 7½ miles, with a coal branch of 4 miles, making 514½ miles in all. The three leased lines are continuous, and form a branch from Leavittsburg, O., to Cleveland, 61 miles, and a loop-line from Leavittsburg to Sharon Junction, 28½ miles. During the year the Hazleton branch, 1½ miles, built to serve furnaces south of Youngstown, was rebuilt and leased to the Pittsburgh & Lake Erie road, forming part of the main line of that road. The fourth annual report of Gen. J. H. Devereux, Receiver, is for the calendar year, 1878.

The traffic of the road for the year was as follows:

Passengers carried: 1878. 1877. Inc. or Dec. P. c.
Through 125,046 84,777 I. 40,269 47.5
Local 794,018 759,092 I. 34,926 4.5

Total 919,064 844,339 I. 74,725 8.8

Passenger mileage: 18,707,617 14,310,807 I. 4,396,810 30.7

Local 18,534,987 18,643,479 I. 491,508 2.7

Total 37,242,604 32,954,286 I. 4,288,318 13.1

Tons freight carried: 1,326,966 1,592,020 D. 265,054 16.7

Local 1,327,747 1,511,983 I. 115,764 9.5

Total 2,653,830 2,804,003 D. 150,164 5.4

Tonnage mileage: 240,786,360 260,407,002 D. 10,620,642 4.1

Local 80,939,836 79,971,485 I. 3,968,351 5.2

Total 330,726,196 337,378,487 D. 6,652,291 2.0

Some averages and deductions from the traffic returns are as follows:

Passenger: 1878. 1877. Freight: 1878. 1877.
No. of cars per train 4.6 4.3 16.29 16.00

Av. No. passengers or tons per car 10.2 9.5 5.98 5.96

Av. earn. per train mile 73.9712 cts. 73.4231 cts. 81.5272 cts. 86.9815 cts.

Av. cost per train mile 49.3271 " 46.7128 " 70.9161 " 69.0446 "

Av. receipt per passenger per mile 2.2428 " 2.3106 "

Av. cost per passenger per mile 1.3834 " 1.2738 "

Av. profit per passenger per mile 0.8594 " 0.8428 "

Av. receipt per ton per mile 0.8359 ct. 0.9088 ct.

Av. cost per ton per mile 0.7271 " 0.7308 "

Av. profit per ton per mile 0.1088 " 0.1780 "

The reduction in expenses was not enough to overcome the serious decrease in the average freight rate. A comparison of some classes of tonnage carried is as follows:

1878. 1877. Inc. or Dec. P. c.
Anthracite coal, tons. 30,064 43,793 D. 13,729 15.6
Bituminous coal, tons. 584,779 703,352 D. 118,573 16.9
Ore, tons 255,008 245,199 I. 10,709 4.4
Oil barrels 2,027,792 3,530,188 D. 1,502,396 42.6

The average earnings per barrel on oil, however, increased 11 per cent., so that the loss in earnings was less in proportion than that on bulk of traffic. On ore and coal there was a loss in rates as well as in traffic, showing a considerable falling off in earnings from coal, and a decrease on ore, in spite of the gain in quantity moved.

The average rate per ton per mile, in cents, for seven years, has been as follows:

1872 1.496 1876 0.905
1873 1.450 1877 0.908
1874 1.180 1878 0.835
1875 0.981

The earnings for the year were as follows:

	1878.	1877.	Inc. or Dec.	P. c.
Freight.....	\$2,764,780.77	\$3,091,407.99	D. \$326,627.22	9.8
Passengers.....	835,236.34	749,530.29	I. 85,706.05	11.4
Mail.....	38,613.83	47,362.46	D. 8,748.63	16.3
Express.....	48,824.51	49,946.39	D. 3,121.88	6.3
Miscellaneous.....	59,091.44	60,051.69	D. 960.25	0.6
Total.....	\$3,745,206.89	\$3,973,298.82	D. \$228,091.93	5.7
Expenses.....	2,972,858.10	3,004,381.46	D. 31,523.36	1.0

	1878.	1877.	Inc. or Dec.	P. c.
Net earn. per mile.....	7,270.31	7,720.70	D. 441.39	5.7
Net earnings per mile.....	1,501.16	1,883.22	D. 382.06	20.3
Per cent. of expenses.....	79.38	75.61	I. 3.77	5.0

The Receiver's statement of the results for the year is as follows:

Gross earnings from operation.....	\$3,745,206.89
Operating expenses.....	2,972,858.10
Net earnings from operation.....	\$772,348.79
Earnings from other sources.....	12,352.34
Total net earnings from all sources.....	\$784,701.13
Fixed charges paid:	
Rental of equipment.....	\$335,463.83
Rental of all leased lines.....	312,573.21
General expenses, taxes, etc.....	156,594.11
Total.....	804,631.15
Deficit.....	\$19,000.02
Expenditures for additions during 1878.....	108,201.09
Total deficiency.....	\$128,161.11

The similar statement for the period of the receivership, from Dec. 10, 1874, to Dec. 31, 1878, four years and 21 days, is as follows:

Gross earnings from operation.....	\$15,372,819.65
Operating expenses.....	11,985,277.32
Net earnings from operation.....	\$3,387,542.33
Earnings from other sources.....	40,373.01
Net earnings from all sources.....	\$3,427,915.34
Fixed charges:	
Rental of equipment.....	\$1,255,375.04
Rental of all leased lines.....	1,287,463.44
General expenses, taxes, etc.....	528,329.74
Total.....	3,071,168.22
Net income during receivership.....	\$356,747.12
Additions and betterments strictly chargeable to capital acc't.....	362,943.27
Net deficiency, Dec. 31, 1878.....	\$6,196.15

The Receiver's remarks on the general results of the year are as follows:

"In addition to the loss of net revenue by the prevailing rates of two and three mills per ton-mile in the carriage of very much of the through east-bound traffic, the financial operations of 1878 are marked by unusual expenditures through sheer necessity.

"On the 11th and 12th of September, a storm and flood fell upon certain portions of the railroad, the main part of the tempest being in Trumbull County, where, along the Mahoning Division, the river and streams rose from six to nine feet higher than was ever before known, even with ice freshets. And, between the hours of midnight and six o'clock of the morning of Sept. 13, this storm had swept out the centre stone pier of the bridge at Warren, destroying 210 feet of double-track iron superstructure; had totally demolished 425 lineal feet of Howe truss bridging at sundry points, and had damaged many other bridges. It had washed out four large arch culverts of stone, with the embankments covering them, and had destroyed and shattered a large number of smaller arch culverts, as well as washing away the road-bed and embankments in thirty-two places, the breaks varying in length from 100 feet to half a mile.

"Four passenger trains and 19 freight trains were cut off and isolated by the wash-outs. The freight traffic was interrupted for six days, and the passenger traffic for four days, the latter being transferred across the largest breaks during the work of restoration.

"Aside from the loss by the interruption of the road's traffic in one of the busiest months of the year, there has been thus far expended for extraordinary repairs and renewals, on account of this storm, the sum of \$98,627.22, which is included in operating expenses.

"And another large expenditure of the year has been for power brakes for the passenger equipment, \$24,299.95. This, with other large outlays, was required by pressing circumstances, and is more particularly explained in the annexed exhibits.

"The property has continued to suffer in proper economy of management, from lack of owning a sufficient and adequate equipment. The total payments on account of rentals of equipment during the receivership now amount to over one and one-quarter million dollars. The entire leased equipment would not be worth, as new, at present cost rates, the amount of its rental which has been paid to this time.

"Of the new connections of the railroad there is as yet nothing to be said. The Pittsburgh & Lake Erie Railroad has been delayed in completion by the severe weather of the fall and winter, but will undoubtedly be open and in complete running order between Pittsburgh and Youngstown before another month.

Harmonious relations continue with all connecting lines. The traffic at Mansfield, and especially in respect of the live stock, through the joint yards at that point, has improved.

New Jersey Midland.

Messrs. G. A. Hobart and J. W. McCulloh, the Receivers who have managed this property since March 30, 1875, have prepared a report for the year 1878, from which the following statements are taken: The road extends from West End, N. J., to Unionville, N. J., 71 miles, and is extended to Middletown, 14 miles, by the Middletown, Unionville & Water Gap road, held under a perpetual lease. The line from West End to Granton, 4 1/4 miles, is claimed by the Hudson Connecting Company, but the Receivers have refused to recognize that claim; it will be settled in the foreclosure suit. The trains run from West End to Jersey City, 2 1/2 miles, on the Pennsylvania track.

The indebtedness of the company on March 30, 1875, as near as can be ascertained, was as follows:

Bonds (\$77,405 per mile).....	\$5,500,000
Stock (\$20,053 per mile).....	1,423,745
Floating debt (\$13,942 per mile).....	989,724
Total (\$111,400 per mile).....	\$7,913,469

The property other than the road and franchises, consists of buildings, etc.; 14 locomotives; 26 passenger and baggage cars; 64 box, 72 flat and 54 ore-dump cars; 71 gravel, 1 tool, 1 derrick car and 1 steam shovel, with supplies on hand, are valued at \$307,295. On 13 passenger and 34 box cars there are vendors' liens, which are being paid off in monthly installments.

The lease of the Middletown, Unionville & Water Gap road is valuable; it not only gives the road a terminus and connections at Middletown, but for two years past it has con-

tributed in milk alone nearly twice the amount of its rental to the freight receipts.

The gross receipts from all sources for the three years and nine months of the receivership were as follows:

Gross receipts from all sources.....	\$2,481,739.90
Expenses, taxes, interest, drawbacks, etc.....	\$2,031,128.65
Rental of leased road.....	142,500.00
Total.....	2,173,628.65

Net earnings of the receivership..... \$308,111.25

When the Receivers took charge, the road was in a very bad condition, requiring large expenditures for renewals; as its condition has been improved the proportion of expenses to earnings has been steadily diminished, increasing their power to extinguish the right of way and other prior claims. The Receivers had authority to issue \$170,000 in certificates, but have used only \$65,000 in payment for some locomotives, and \$30,338 in settlement of overdue rental; of this amount \$51,184.07 have been paid and canceled, leaving \$44,199.93 outstanding Jan. 1, which it is hoped will be nearly all paid in the current year. The Receivers have paid in cash the following amounts:

Construction.....	\$114,991.00
Equipment.....	135,312.73
Right of way.....	48,775.70
Settlement of back rentals.....	18,942.57
Total.....	\$317,732.00

Three new engine-houses have been built and considerable progress made in filling in trestles and renewing truss bridges. The filling in of the trestles will be continued, and it is expected that all the heavy filling will be completed this year, except the West End trestle. Only necessary work will be done upon this until the question of ownership is decided. Last year 1,800 tons of silicon steel rails and 119,200 new ties were used in renewing track. Severe damage was done at Wortendyke and other points by the heavy freshet of Dec. 10, 1878, causing considerable expense.

The road is obliged to lease terminal facilities at both ends, and especially at Jersey City, this has been an onerous charge. The Receivers have secured a reduction last year from the Pennsylvania Railroad Company, amounting to \$15,940.80, and hope to secure a further reduction.

The question of the damages to be paid by the Delaware, Lackawanna & Western Company for the grade crossing at West End is still before the Chancellor.

The earnings of the road last year, after deducting all drawbacks, etc., and all terminal charges on the Pennsylvania Railroad, were:

	1878.	1877.	Inc. or Dec.	P. c.
Passengers.....	\$122,333.86	\$92,921.06	I. \$29,412.80	31.7
Freight.....	355,564.25	319,392.91	I. 36,171.34	11.3
Mail, etc.....	5,926.27	16,386.41	D. 10,460.14	63.8
Total.....	\$483,824.38	\$428,700.38	I. \$55,124.00	12.9
Expenses.....	320,745.92	308,352.69	I. 12,393.23	4.0
Rentals.....	40,672.00	40,672.00		
Total.....	\$804,417.92	\$777,724.07	I. \$26,693.85	3.4

Net earnings.....\$122,406.46
Gross earn. per mile.....\$79,676.20
Net.....\$1,440.08
Per cent. of exps.....74.70

Of the rentals \$37,960 were paid to the Middletown, Unionville & Water Gap, and \$2,712 for trackage at Middletown. Passenger business shows a steady gain. Freight also shows an increase in spite of a falling off in iron ore and some other articles. The most important business is in milk, and special attention has been given to that traffic. The number of 10-gallon cans carried for four years has been as follows:

	1875.	1876.	1877.	1878.
No. cans.....	208,596	329,642	360,648	374,257
Increase.....		61,070	37,006	7,609

And January, 1879, shows an increase of 2,000 cans over last year.

The road is now fairly established, and, with a continuance of the present careful and intelligent management, there is no reason why it should not pay interest on a reasonable capital account, representing nearly its actual cost.

St. Louis, Iron Mountain & Southern.

This company owns and works the following lines of 5 feet gauge:

	Miles.
St. Louis to Texarkana, Tex.....	490.0
Bismarck, Mo. (75 miles south of St. Louis) to Belmont.....	120.0
Poplar Bluffs, Mo., to Bird's Point, opposite Cairo, Ill.....	71.0
Mineral Point, Mo., to Potosi.....	3.5
Total.....	684.5

The main line connects at Texarkana with the Texas system of roads; the Belmont line by ferry across the Mississippi with the Mobile & Ohio and the Southern system, and the Cairo line, also by ferry, with the roads entering Cairo, Ill. The report is for the year ending Dec. 31, 1878.

The equipment consists of 118 engines; 46 passenger, 1 sleeping, and 24 baggage, mail and express cars; 600 box, 149 Green Line box, 295 Texas Line box, 441 stock, 1,022 platform and 44 caboose cars; 1 directors' and 5 service cars. The company also owns one-half interest in 7 Pullman cars.

The condensed balance sheet is as follows:

Stock (\$31,365 per mile).....	\$21,469,101.00
Bonded debt.....	\$25,600,000.00
Certificates for funded interest.....	2,289,710.00
Coupons outstanding, to be funded.....	108,455.00
Accrued interest on bonds and certificates.....	1,979,889.35
Total bond liabilities (\$44,305 per mile).....	\$30,327,055.35
Bills payable, real estate.....	101,788.08
Bills, accounts and pay-rolls audited.....	437,240.40
Total.....	\$52,335,184.43

Construction and equipment (\$66,089 per mile).....	\$45,237,715.97
Real estate.....	656,077.08
Land grant.....	3,648,008.14
Land notes, accounts, etc.....	604,826.58
Supplies and materials on hand.....	198,310.84
Cash and cash assets.....	752,929.00
Income.....	1,236,415.92
Total.....	\$52,335,184.43

Changes during the year were a decrease of \$2,050 in stock; an increase of \$649,228.10 in bond liabilities; a decrease of \$223,129.92 in bills payable. The floating debt is now practically extinguished and limited to the ordinary current balances.

Under the agreement lately made with the bondholders \$4,163,295 coupons and interest certificates will be funded in first-preferred income bonds; \$3,934,000 consolidated bonds and \$56,000 interest, and \$99,000 Cairo & Fulton income bonds in second-preferred income bonds. This will leave absolute interest-bearing bonds amounting to \$21,876,000, on which the annual interest charge will be \$1,531,320, or \$2,237 per mile of road. The annual charge on the income bonds, to be paid only if earned, will be \$536,770.65, or \$784 per mile.

The Land Department reports in Arkansas sales of 52,554

acres for \$142,834.90, and town lots for \$9,447. Total cash receipts, including payments on land contracts, timber sales and rents were \$85,101.21. Expenses of Land Department, \$33,873.15. Taxes have been assessed on the lands and they have been sold for arrears, and must be redeemed by June, 1879, which will require nearly \$80,000, covering four years' taxes.

In Missouri there were sold 3,523 acres and nine town lots for \$14,361.40. Cash receipts on land contracts were \$8,692.57; expenses of department for the year, \$4,894.69.

The traffic of the road for the year was as follows:

	1878.	1877.	Inc. or Dec.	P. c.
Train mileage.....	787,721	774,897	I. 12,824	1.7
Passenger.....	1,358,704	1,312,118	I. 46,586	3.6
Freight.....				
Total.....	2,147,425	2,087,015	I. 60,410	1.8
Locomotive mileage.....	2,780,893	2,689,062	I. 91,831	3.4
Cost per mile.....	19.6 cts.	18.8 cts.	I. 0.8 ct.	4.3
Passenger train car mileage.....	4,089,770	4,032,546	I. 57,224	1.4
Freight car mileage.....	29,559,449	27,876,392	I. 1,683,057	6.0
Passengers carried.....	600,556	570,763	I. 29,793	5.2
Passenger mileage.....	32,686,103	33,403,029	D. 706,926	2.1
Tons freight carried.....	694,901	674,632	I. 19,269	3.0
Tonnage mileage.....	170,985,859	162,308,855	I. 8,690,004	5.4
Av. train load.....	41.51	43.11	D. 1.60	3.7
Passengers, number.....	125.85	123.70	I. 2.15	1.7
Freight, tons.....				
Av. rate.....				
Per passenger per mile.....	3.21 cts.	3.32 cts.	D. 0.11 ct.	3.3
Per ton per mile.....	1.92 "	1.98 "	D. 0.06 "	3.0

The freight traffic was very nearly evenly divided between north and south-bound; nevertheless a large mileage of empty cars was necessary, the pressure of freight coming at different seasons. The division of traffic and the rates on each class were as follows:

	Local north.	Local south.	Through north.	Through south.
Per cent. of total.....	22.7	15.1	26.6	35.6
Rate per ton per mile.....	2.25 cts.	3.18 cts.	1.42 cts.	2.17 cts.

Leading articles of freight last year were 89,409 tons iron and iron ore; 86,192 bales cotton; 121,450 tons lumber, etc.; 77,753 tons grain and flour; 31,430 tons meat, and 462,376 car-loads stock. The stock traffic showed a large decrease last year.

The earnings for the year were as follows:

	1878.	1877.	Inc. or Dec.	P. c.
Freight.....	\$3,282,897.71	\$3,208,749.84	I. \$74,147.87	2.3
Passengers.....	1,027,884.16	1,108,608.22	D. 80,724.06	7.3
Mail and express.....	169,302.36	148,722.30	I. 20,579.97	13.8
Miscellaneous.....	34,236.05	24,282.21	I. 9,953.84	41.0
Total.....	\$4,514,320.18	\$4,500,422.66	I. \$13,897.52	0.3
Working expenses.....	2,334,074.95	2,130,091.91	I. 203,983.04	9.6
General expenses.....	234,290.33	238,429.04	D. 4,138.71	1.7
Total.....	\$2,568,365.28	\$2,368,520.95	I. \$199,844.33	8.4

Net earnings.....	\$1,945,954.90	\$2,131,901.71	D. \$185,946.81	8.7
Gross earn. per mile.....	6,505.07	6,574.76	I. 69.69	0.3
Net earn. per mile.....	2,842.80	3,114.54	D. 271.74	8.7
Per cent. work-ing exps.....	51.70	47.33	I. 4.37	9.2
Per cent. all exps.....	56.80	52.63	I. 4.17	8.1

Local receipts were considerably reduced by the enforcement of the Missouri law regulating rates, and without any corresponding reduction of expenses. The yellow fever caused a considerable loss of passenger traffic.

Renewals for the year included 48 tons iron, 3,557 tons steel rails and 340,760 ties; 2.78 miles of new sidings were built. There are now 128.19 miles of steel track. The usual renewals and improvements of bridges and buildings were made.

President Allen's report says: "The amount audited against interest account during the year was \$1,994,444, toward the payment of which \$84,371 were derived from the proceeds of land sales, leaving \$1,910,072 to be provided for out of the net earnings of transportation. These earnings were more than sufficient to cover the entire balance of the interest charge by the sum of \$35,883.

"But there was expended during the year \$230,804 for construction and equipment; \$24,741 for real estate; \$25,615 for taxes on the Arkansas trust lands, and \$5,610 to pay a judgment obtained against the Cairo & Fulton Railroad. The taxes paid in Arkansas may possibly be recovered, but only in case that the Supreme Court of the United States, to which an appeal has been taken, shall reverse the courts of Arkansas.

"The floating debt was nominal and overbalanced by the cash assets. The company paid during the year all the accruing interest upon the first-mortgage (I. M.) bonds, and upon the deferred interest certificates, and half the interest upon all other classes of bonds, so far as the coupons were presented. The total amount of coupons paid and canceled was \$1,166,020. The gross earnings for the year were not quite equal to expectation, and the operating and general expenses were somewhat larger in proportion than they were during the year 1877."

The report refers to the closing of litigation by the compromise agreement with the bondholders; a copy of the agreement is appended. It says in conclusion:

"Our land sales in Arkansas are hampered and delayed by the conditions of the mortgage made by the old Cairo & Fulton Railroad Company to the Union Trust Company. We are at the same time subjected to a competition by the offerings of lands at lower prices by other corporations, and by the state. The business of the company will be greatly increased by the settlement and improvement of these lands, and therefore it is interested in adopting such prices, and in offering such inducements as will hasten the desired result.

"The iron rails originally laid in our track are showing the effects of the heavy traffic passing over them, and must soon be generally supplanted by steel. The track between Poplar Bluff and Bird's Point is the only part of the line which does not show material deterioration. It is a remarkable fact that while our iron rails cost us \$90 per ton, we purchased steel rails, delivered during 1878, at \$45 per ton. We laid 35 miles of new steel during the year, and propose, during the year ensuing, to lay between 50 and 60 miles, contracts for which have already been made at an advance of about \$1 per ton over the price of last year. No extraordinary expenditure is anticipated in the coming year, unless it should be decided to change the gauge of the road from 5 feet to 4 feet 8 inches. The estimated cost of such change, now that our new shop buildings at De Soto are nearly completed, is from \$150,000 to \$200,000. Possibly, some new rolling stock may be needed, and the 450 cars, now running upon a rent charge of one cent per mile run, ought to be purchased. A new bridge at the crossing of Red River is contemplated during the coming year, and its cost is estimated at about \$90,000. It is quite possible that it may be necessary to advance \$75,000 to \$80,000 during the year to preserve our title to the lands in Arkansas, as stated by the Land Commissioner."